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PHARMACEUTICAL JOURNAL

AND

TRANSACTIONS.

VOLUME III.

1843-4.

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PREFACE

TO THE THIRD VOLUME.

THE Pharmaceutical Chemists of this country, to whom chiefly this Journal is addressed, were at the time of its commencement forming themselves into a permanent Association which was designed to effect a substantial improvement in the position and also in the qualifications of that body. Accordingly, the early numbers were chiefly devoted to the discussion of the events in progress and the importance of the several objects contemplated in the new Society. The scientific articles were rather elementary in their character and formed comparatively a small portion of each number.

As the Society progressed, and the aid of some of the highest authorities in this country was obtained in the form of contributions to the Journal, the plan of the work was gradually enlarged, and it has now become a vehicle for the publication of all the progressive improvements and discoveries in Pharmacy and the Sciences connected with it, in addition to such elementary and practical information as is likely to be useful to the Student.

June 1*st*, 1844.

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THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. I.—JULY 1st, 1843.

THE BENEVOLENT FUND.

If a house which was not insured happen to be burnt down, the owner receives but little sympathy from his friends, many of whom remark that "it serves him right." When a mechanic or artisan is thrown out of work by illness, and is destitute of the common necessaries of life, he is told that he may thank himself for this destitution, as he ought to have subscribed to a club. A man who dies, leaving his family totally unprovided for, entails a stain on his memory, and is blamed for not having ensured his life. Improvidence is always considered a failing, in some cases it is a positive sin.

Those who are dependent upon their own exertions in business for subsistence, are liable to a variety of casualties for which they should endeavour to be prepared. The influence of competition, the depression of trade, the changes of fashion, and the caprice of the public, may, within a short period of time, change the aspect of affairs and reduce a man from a state of affluence to difficulties or absolute want: ill health may cramp or entirely suspend exertion in business, or premature death may cut off the possibility of making the requisite provision for a family. These remarks apply more or less to all trades and professions, and we have no reason to believe that the Drug Trade forms an exception to the general rule. On the contrary, if we may judge from the com-

plaints which are so frequently made respecting the depression of the trade, it would appear that an institution for the relief of the unfortunate is particularly required by the Chemists and Druggists. Yet this is almost the only class of the community which is unprovided with an efficient BENEVOLENT FUND.

In the medical profession, among other institutions of this nature, there is a *Society for the Relief of Widows and Orphans of Medical Men* residing in London and its vicinity. The anniversary of this society took place on Saturday, the 3d of June, on which occasion it was stated, in the report, that the sum of £1300 had been expended, during the past year, in the relief of widows and orphans; and that £385 had been added to the capital stock, which now amounted to nearly £41,000.

The Artists have two benevolent institutions of considerable magnitude. One is called the *Artists' General Benevolent Institution*, and its funds are appropriated in donations to artists of merit who are in distressed circumstances, whether subscribers or not. It is necessary, however, for the candidates to obtain recommendations from subscribers, and to show that they are not receiving relief from any other source. The other is called the *Artists' Benevolent Institution:* its constitution is more like that of a club, and each member is entitled, in case of illness, to an allowance of six pounds per month during the time that he is incapacitated from following his profession. The widows of artists who have left their families destitute, are entitled to an annuity for life, with other relief in certain cases. Both of these institutions are assisted by donations and subscriptions from patrons of the arts and other charitable persons.

The *Royal Society of Musicians* has for many years flourished, and its funds are in a prosperous state. Each member, who becomes destitute from ill health or other misfortune, receives an allowance of £4 4*s.* per month, or, if married, £5 5*s.* There is also an allowance for widows and orphans.

A society for the Relief of *Female Musicians* has recently been established.

The *Linen-drapers'*, *Silk Mercers'*, *Lacemens'*, *Haberdashers'*, *and Hosiers' Institution*, was established in the year 1831, and, according to the annual report for the year 1842, the funds of the institution amount to above £20,000, in addition to which, the annual subscriptions exceed £800. Above £4000 of the capital was raised in one day.

The *Tailors' Benevolent Society* was established in 1837, and the income from its permanent fund now amounts to £1200 per annum, in addition to which, Almshouses are provided for decayed subscribers, the building of which cost above £11,000. The donations to this institution exceed in liberality any others of that class, one member having contributed in various sums upwards of £12,000 since the establishment of the society, and other members donations varying from £50 to £500.

The *Butchers* are provided with a very effective Benevolent Society, the usual subscription to which is one guinea or two guineas. Among the donations, which are very extensive, the sums range from a guinea to 100 guineas; fifty being rather a common donation.

It is needless to enumerate other instances, but we are not aware that there is any class in the community which is unprovided with some Benevolent Society or Club, except the Chemists and Druggists, who have nothing of the kind. This is an extraordinary fact, and the want of unity among our members, which has so often been commented upon, is the only circumstance which can account for it. When the trade was brought together two years ago, by the force of circumstances, and a permanent association was proposed, the idea of establishing a fund for the relief of the unfortunate, simultaneously occurred to the Members of the Committee, and this became one of the prominent features of the institution.

But very little has been done towards the accomplishment of this object. A few small donations have been received and two sums of £500 each have been voted from the general funds of the society to this especial purpose. The Council for the past year, in their

annual report, recommended the adoption of some effectual measures for raising an amount of capital, and a list of donations was prepared, but the largest donation on the list is ten guineas, and the sum total realized by this effort is within £200. The present Council are anxious to follow up this modest beginning, and for this purpose have made an appeal to all their brethren, which we trust will be responded to in a substantial and creditable manner.*

We cannot expect to compete with the tailors in the munificence of our donations, nor can we hope, like the linen-drapers, to raise £4000 in one day; but we ought to recollect, that until we have amassed a capital of £20,000, our means of affording relief will be very limited, and that if we rely upon the annual appropriation of £500 from the general fund, very few of the present generation will live to see this benevolent object in prosperous and active operation.

While we consider it our duty to place the subject in this point of view, it must be understood that all donations to the BENEVOLENT FUND are entirely voluntary and disinterested. According to the laws of the Society, every distressed Member and Associate will be entitled, under certain regulations, *in case of need*, to relief from this fund as soon as the amount in hand will justify such distribution. But those who, by giving liberal donations, are instrumental in rendering available at an early period, this fund for the relief of their unfortunate brethren, will enjoy the reward which usually accompanies or follows the performance of a Christian duty.

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* See page 25 and the advertisement on the cover.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE II.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
HONORARY MEMBER OF THE PHARMACEUTICAL SOCIETY.

(*Continued from the last Number, page 740*).

Test of Double Refraction.—From the preceding statements then, it appears, that the polariscope becomes a very delicate test of double refraction. A very large number of crystalline, and other bodies, possess a doubly refractive property; but comparatively few of these have it in so high a degree as to present, under ordinary circumstances, the phenomenon of double images; that is, the separation of the two systems of ethereal waves is not, in general, sufficiently great to be visible to the eye. In such cases, therefore, the polariscope is of great value, since it enables us to detect the slightest degree of double refraction. Some doubly refracting bodies present, in the polariscope, most gorgeous colours, as selenite. Others, however, which possess the doubly refractive property in a much slighter degree, require the aid of a thin film of selenite, of uniform thickness. Their double refractive property then becomes evident by the change which they induce in the colour of the film. Without this, we see light or dark fringes or bands, or black or white crosses, but no colour.

Cause of Double Refraction.—Being now in possession of an exceedingly delicate test of double refraction, we are prepared to enter into an inquiry into the cause of this property.

Now we shall find that every body endowed with equal elasticity in every direction, is a single refractor. Alter its elasticity in any one direction, put it in a state of unequal tension, and immediately it acquires the property of double refraction. Hence then, double refraction may be temporarily or permanently communicated to bodies, by temporarily or permanently disturbing the equality of their elasticity in different directions.

1. *Pressure produces double refraction.*—In fluids (gases and liquids) pressure is equally distributed in all directions, which is obviously owing to the facility with which the molecules shift their places. Hence pressure on fluids does not communicate to them the power of double refraction.

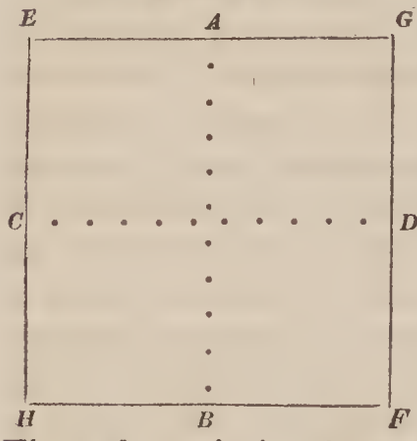
In solids, however, matters are far otherwise. Owing to cohesion, the molecules cannot change their relative positions; and,

therefore, in this form of matter unequal degrees of tension may exist in different directions: so that pressure may be communicated in any desired direction without being equally or uniformly distributed.

Now a transparent solid, as a well-annealed piece of glass, all of whose parts possess equal elasticity, is a single refractor; but if we subject such a body to the influence of a compressing force, it becomes a double refractor, and acquires neutral and doubly refracting (depolarizing) axes; the former parallel and perpendicular to the direction of pressure, the latter 45° inclined to them.

Let us consider for a moment what must be the effect of pressure in any given direction. Suppose a rectangular piece of glass (fig. 20) to be subjected to pressure in the direction *A B*: the immediate effect will be to urge the contiguous particles nearer together in this direction, and thereby to call into action their repulsive forces. But it will also urge the particles asunder in the direction *C D*,—that is, in a direction perpendicular to that of the pressure, and thereby to call into operation their attractive forces. Thus then, it is obvious, that a force, which when applied to a solid, causes a condensation in the direction of the force (*A B*), is attended with dilatation or expansion in a direction perpendicular to it (*C D*). In the first direction the elasticity is a maximum—in the second direction it is a minimum. Incident light polarized in a plane parallel with either of these directions passes through unchanged, and these directions are called the *neutral axes*. But if it be polarized in a plane inclined 45° to either of these directions (that is, in the direction *E F* or *G H*) it is resolved into two systems of waves, one polarized in the direction *A B*, the other in the direction *C D*. The directions *E F* and *GH*, are, therefore, the *doubly refracting* or *depolarizing axes*. But the system polarized in the plane *A B*, will proceed more slowly (owing to the maximum elasticity in that direction) than the system *C D* (which is polarized in the direction of the minimum elasticity). Hence, at their emergence, the two systems of waves are in different phases of vibration, but they do not interfere so as to produce colours, owing to the plane of vibration of the one being rectangular or perpendicular to that of the other. When, however, we apply the analyzer, and restore these two rectangular planes to a common plane, interference takes place and colour results.

Fig. 20.



Let us now take the case of a flexed body. When I bend a cane or other solid, the convex surface is in a state of expansion

or dilatation, while the concave surface is compressed. The molecules on the convex surface are urged asunder, and their attractive forces called into operation, while those on the concave surface are pressed together, and their repulsive forces brought into action. Between these two oppositely affected surfaces, there is a neutral line where equilibrium exists, and on both sides of this the degree of strain augments as we recede from the line. Now, if a well annealed, and, therefore, single refracting plate of glass be bent, and examined while in the polariscope, it will be found to have acquired, while in the bent state, double refracting properties. Two sets of coloured fringes are perceived, one on the convex or dilated side of the plate, and the other on the concave or compressed side. Between these two sets of fringes is a black line, indicating the situation where neither compression nor dilatation exists, and where, therefore, double refraction is absent.

Thus then the polariscope becomes a valuable means of detecting the existence of unequal tension or strains in transparent bodies, and Dr. Brewster has suggested its useful application to the determination of the intensity and direction of all the forces which are excited by a superincumbent load in different parts of the arch, as also the intensity and direction of the compressing and dilating forces which are excited in loaded framings of carpentry. For these purposes, models in glass or copal are to be prepared, and the effects are rendered visible by exposing the models to polarized light. He has likewise constructed a *chromatic dynamometer* for measuring the intensities of forces, founded on the facts already stated. It consists of a bundle of narrow and thick plates of glass, fixed at each end in brass caps. Then when any force is applied to a ring in the middle of the plates, the ends being fixed, the plates of glass will be bent, and the force thus produced is measured by the tints that appear on each side of the black line.

By the gradual induration, as well as by the mechanical compression and dilatation of animal jellies, fringes may be produced, as in glass.

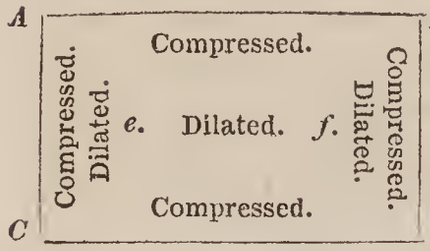
2. *Unequal heating causes double refraction.*—When heat is applied to bodies, it causes them to expand or dilate. If the substance to which the heat is applied be a bad conductor, the part in contact with the heated body becomes hot, and expands before heat is communicated to the neighbouring parts. Hence the bad conductor endeavours to curve, just as when we heat a compound bar of iron and brass, a curvature is induced, owing to the unequal expansile power of these two metals, and as the brass expands more than the iron, the latter forms the inner or concave side of the curved bar, while the brass forms

the outer or convex side. On this principle is constructed the compensation balance of a watch.

Glass is a bad conductor of caloric, and when a heated body is applied to it, the part in contact with this becoming hot, expands, but owing to the bad conducting quality of the medium, the surrounding parts not being influenced by the heat, do not expand, but resist the dilatation of the heated portion. In this way, therefore, the immediate effect of heat on one part of a piece of glass, is to put all the surrounding parts into a strained state, one part is expanding, and other parts are resisting the dilatation. When the difference of temperature is extreme, the violence of the strain is such that very thick pieces of glass are sometimes rent asunder.

It is very desirable that we should be acquainted with the precise mechanical condition of the glass thus partially subjected to caloric. A knowledge of this would greatly assist us in comprehending the optical phenomena. But the subject is replete with difficulties. Perhaps, some assistance may be obtained from the following considerations :—

Fig. 21.



Let *A B C D* (fig. 21), be a rectangular plate of glass, subjected to heat along its edge, *A B*. This portion of the glass being heated, tends to expand; but on account of its connection with other portions of the glass, cannot do so without forcing these to participate in its augmented bulk. These, however, owing to the bad conducting power of the glass, retain their original temperature, and consequently refuse to expand, so that the stratum is subjected to compression; that is, it is prevented from acquiring that volume which is natural to it, in this heated state. The central stratum *e f*, is in a state of dilatation or expansion, owing to its particles being urged asunder by the tendency of the upper stratum, *A B*, to expand. The resistance offered to the expansion by *e f*, tends to produce pressure on the lower stratum *C D*, the particles of which will be urged together. This lower stratum *C D*, like the upper one *A B*, will then be in a state of compression. As the tension of *e f* is sustained at *A B* and *C D*, it will tend to send inwards the lateral columns *A C* and *B D*, dilating them at the convex portion of the bend, and compressing them at the concave portion. By these strains, therefore, the rectangular plate of glass will assume a figure concave on all its edges.

It is obvious then, from the unequal states of tension of the different parts of a piece of glass thus partially heated, that it

ought to acquire doubly refracting properties, and the polariscope shows that it does so. In this state, the glass exhibits distinct *neutral* and *doubly refracting* (*depolarizing*) *axes*, the neutral ones being parallel and perpendicular to the direction in which the heat is propagated. The black fringes, sometimes called lines, of no polarization, indicate the neutral axes, or those portions of the glass which are destitute of the property of double refraction.

It deserves especial notice that fringes make their appearance in the part of the glass most distant from the heated body, before they have received any sensible accession of heat, and which, therefore, must depend on the state of strain into which they are thrown by the effect of the heat on the other parts of the mass, in the way I have already endeavoured to explain.

Dr. Brewster has suggested the construction of two kinds of *chromatic thermometers*, for measuring changes of temperature by the production of coloured fringes, exhibited by glass plates when exposed to heat; for "every tint in the scale of colours has a corresponding numerical value, which becomes a correct measure of the temperature of the fluid." In the one instrument, the tints originate immediately from the changes of temperature; in the other, they are produced by the difference of pressures upon the glass, occasioned by the difference of expansions arising from changes of temperature. I must refer you to his paper in the *Philosophical Transactions* for 1816, for details respecting them.

3. *Unequal cooling causes double refraction.*—If a piece of hot glass of uniform temperature be unequally cooled, as by placing one of its edges on a cold mass of iron, it acquires doubly refracting properties, and when examined by polarized light, presents fringes, &c. similar to those observed in glass unequally heated. It is obvious, however, that as the physical condition produced by cold is diametrically opposite to that caused by heat, so the structure of the corresponding parts of the two glasses (the one which has been cooled, and the other which has been heated) must be opposite.

4. *Unannealed glass is a double refractor.*—If glass be suddenly cooled after having been melted, it possesses certain remarkable properties, which unfit it for ordinary use. Sometimes it splits or flies to pieces in the act of cooling; or if it fail to do this, a very moderate change of temperature, a slight external force, a scratch, or a slight fracture, is sufficient to cause it to crack and fly to pieces. The glass tears called *Rupert's drops*, or *hand-crackers*, and the *proofs*, or *philosophical phials*, are familiar illustrations of this kind of glass. In order to pre-

vent it acquiring this remarkable condition, glass, after being fashioned, is submitted to the process called *annealing*, that is to very slow cooling in the annealing oven or lier. Glass which has undergone this process is said to be *annealed*, while that which has not is termed *unannealed*. But the so-called unannealed glasses sold by the opticians are in fact annealed glasses, which have been reheated until they begin to soften, then cooled by placing them on the ashes beneath the furnace, and afterwards ground and polished.

The optical properties of unannealed glass are very remarkable. To comprehend them let us consider the mechanical condition of the glass. When a mass of red-hot and soft glass is exposed to a cool air, its external portion becomes cold and rigid, while the inner parts are still hot and soft. After a short time, however, the latter solidify and cool, but are prevented from contracting themselves into the smaller bulk which is natural to them in their cooled state, by the rigid crust, which acts like an arch or vault, and keeps them distended, but which is to a certain extent strained and drawn somewhat inwards by the tension exercised on it by the internal parts. It is obvious then that the different parts of a mass of unannealed glass are unequally and differently strained; the internal being in a state of distention or dilatation, the external in that of compression. So that the state of the different parts, and the distribution of the forces, will be almost exactly similar to those already described, in the case of annealed glass which has been unequally heated. "The analogy between the cases," says Sir John Herschel, "would be complete, if, instead of supposing the annealed plate heated at one edge only, the heat were applied to all the four simultaneously, by surrounding it with a frame of hot iron."

There is one very important point in reference to these unannealed glasses, to which I must beg your attention; I refer now to the circumstance that in them, *the polarizing* (doubly refracting) *structure depends entirely on the external form of the glass plate*, and on the mode of aggregation of its particles. This will be very obvious by observing the different shapes of the fringes respectively presented by square, circular, oval, rectangular, and other shaped plates. The circular and square plates have only one axis of [no] double refraction; whereas the oval and rectangular plates have two axes. By dividing and subdividing these plates, the doubly refractive property is not only greatly diminished, but sometimes even destroyed, if the portion be very small. Moreover, it is distributed in a new manner, according to the shape of the fragment. The dissected unannealed glasses,

sold in the opticians' shops, beautifully illustrate the dependence of the form of the coloured fringes on the external shape of the glass. Thus the pattern produced by one circular piece of unannealed glass, is very different to that of a circle formed by joining four segments.

In these particulars, the unannealed plates of glass differ very widely from doubly refracting crystals. The fringes and colours, presented by the latter, are unaltered by the changes we may effect in the external form of the crystal—the smallest fragment producing the same system of fringes as the largest; and, provided the thickness remains the same, the polarizing force suffers no diminution by the reduction in size.

We are then constrained to infer that the optical properties of crystals are those of their integrant molecules; while those of the unannealed glasses depend on the mode of arrangement of the molecules, and on the external form of the mass.

The effects produced by superposing similarly shaped pieces of unannealed glass are striking, and, at first, surprising; but, on reflection, are easily understood. If they be symmetrically superposed, similar points being laid together. the tints will be equal to the sum of the separate tints:—but, if superposed crosswise, the resulting tints will be the difference of the separate tints. This may be conveniently shown by causing an unannealed glass bar to rotate in front of another unannealed bar.

These facts respecting the properties of unannealed or imperfectly annealed glasses, admit of some valuable practical applications. To the optician it is of the highest importance that the glass, of which lenses and prisms are made, should possess uniform density, and be free from all defects arising from irregularities in the annealing process. To detect these the glass should be carefully examined by polarized light previous to being ground and polished; and by this agent the slightest defects are made appreciable.

So also glass vessels employed for domestic purposes may be advantageously tested by the same agent. The facility with which tumblers, &c. crack, sometimes spontaneously, at other times while in the hands of the glass-cutter, or when warm water is poured into them, or when exposed to a slight blow, depends on some imperfection in the annealing process. Hence, also, the reason why *run glass* (that is, glass made without paying the duty) is very apt to crack; for owing to the rapidity with which all the stages of its manufacture have been hurried on, it is not well made, and sufficient time has not been allowed for the annealing process.

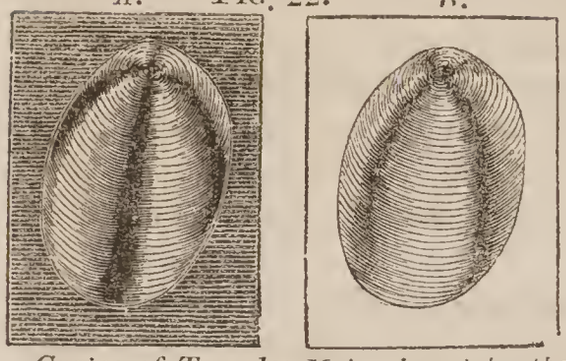
It is probable, also, that manufacturers, or rather the mounters

of electrical machines, might beneficially avail themselves of polarized light in the selection of glass cylinders and plates. Recently made cylinders, when mounted, will sometimes crack, or fly, as it is termed, without any obvious agency, owing, I presume, to some defect in the annealing process, which, perhaps, might have been previously discovered by means of polarized light.

An argument in favour of the vegetable origin of the diamond has been founded by Dr. Brewster, on the phenomena presented by this substance, when examined by means of polarized light. It is well known that various opinions have been held by different writers on the mode of formation of this mineral. All of them, however, may be included under two divisions: those which assume the diamond to be the direct produce of heat on carbonic acid or carbon, and those which ascribe it to the slow decomposition of plants. Dr. Brewster, who adopts the latter notion, met with a diamond which contained a globule of air, while the surrounding substance of the diamond had a polarizing (doubly refracting) structure, displayed by four sectors of polarized light encircling the globule. He, therefore, inferred that this air bubble had been heated, and by expansion had produced pressure on the surrounding parts of the diamond, and thereby communicated to them a polarizing structure. Now for this to have happened, the diamond must have been soft and susceptible of compression. But as various circumstances contribute to prove that this softness was the effect of neither solvents nor heat, he concluded that the diamond must have been formed, like amber, by the consolidation of vegetable matter, which gradually acquired a crystalline form by the influence of time and the slow action of corpuscular forces.

Starch grains have a laminated texture, and possess a doubly refractive power. They are composed of concentric layers of amylaceous matter. On some part of the surface of each grain is a circular spot, called the *hilum*. This appears to be an aperture or transverse section of the tube or passage leading into the interior of the grain, and by which the amylaceous matter, forming the internal laminæ, was conveyed. On examining the grains by the polarizing microscope, unequivocal evidence of their doubly refractive power may be obtained. At least I have found this to be the case in all the starches which I have yet examined, viz., *tous les mois*, potato-starch, West Indian arrow-root, sago-meal, Tahiti arrow-root (obtained from a species of *Tacca*), tapioca-meal, East Indian arrow-root (*Curcuma angustifolia*), wheat-starch, Portland arrow-root (*Arum maculatum*), and rice-starch. The larger grained starches form splendid objects for the polarizing microscope; *tous les mois* being the largest may be taken as the type of the others. It presents a black cross, the arms of which meet at the hilum.

A. FIG. 22. B.



Grains of Tous les Mois viewed by the Polarizing Microscope. *A.* represents the appearance when the planes of polarization of the polarizer and analyzer are at right angles to each other; *B.* when they coincide

On rotating the analyzer the black cross disappears, and at 90° is replaced by a white cross; another, but much fainter black cross, being perceived between the arms of the white cross. Hitherto, however, no colour is perceptible. But if a thin plate of selenite be interposed between the starch grains and the polarizer, most splendid and gorgeous colours make their appearance. The arms of the cross acquire the colour which the selenite plate yields in polarized light. The four spaces between the arms also appear coloured; but their tint is different to that of the cross. The colours of the first and the third spaces are identical, but different to those of the second and fourth, both of which have the same tint. At the point where the colours of the arms and of the interspaces meet the tints blend. All the colours change by revolving the analyzer; and become complementary at every 90°.

The appearances presented by potato-starch are similar to those of *tous les mois*. Several other starches (as West Indian arrow-root, sago-meal, Tahiti arrow-root, tapioca-meal, and East Indian arrow-root) present black and white crosses, and, when a selenite plate is used, also colours; but in proportion as the grains are small, are their appearances less distinct. I have not hitherto detected the black and white crosses in wheat-starch, Portland arrow-root, and rice-starch. Their double refractive power, however, is proved by the change they effect in the colour yielded by a plate of selenite.

A great variety of animal structures possess a doubly refracting or depolarizing structure, as a quill cut and laid out flat on glass, the cornea of a sheep's eye, a piece of bladder, gold-beaters' skin, human hair, a slice of a toe or finger nail, sections of bones, of teeth, &c. The crystalline lenses of animals also possess this property in a high degree, owing to their central portion being denser and firmer than the external portion. If the lens of a cod-fish be placed in a glass trough of oil or Canada balsam, it presents twelve luminous sectors separated from each other by a black cross. Even living animals present double refracting properties. The aquatic larvæ of a gnat, commonly called *skeleton larvæ*, form a very amusing exhibition. They are to be placed in water in a very narrow water-trough. In certain positions, they give no evidence of double refraction, but in others, and especially when they are exerting much muscular energy, they possess it in a very marked degree.

[*To be continued in our next.*]

PHARMACEUTICAL MEETING,

JUNE 14th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

The Chairman observed, that having been since the last meeting elected to the office of Vice-president for the ensuing year, it became his duty, in the absence of the President, to take the chair; and, in opening the meeting, he took the opportunity of reminding the Members that the present was the commencement of the third year since the formation of the Society. He begged to thank those Members and friends who had contributed to the interest of these meetings, and to express a hope that the support hitherto afforded would be continued, not only by the contribution of papers, but also by the attendance of those practical men whose position might enable them to give useful information. He had pleasure in announcing a communication on a practical subject, namely a paper

ON THE PREPARATION OF PURE IODIDE OF POTASSIUM.

BY MESSRS. THOS. AND H. SMITH, EDINBURGH.

Of the value of the various processes which have been recommended for the preparation of the iodide of potassium, in reference to their facility of preparation, economy, and suitableness for the production of a pure salt, we do not feel ourselves qualified to give an authoritative judgment; we are, however, inclined to give the preference to that adopted by the Colleges of London and Edinburgh, which is grounded on the double decomposition of the iodide of iron by a solution of the carbonate of potash; but by proceeding in the way recommended by these colleges, a pure salt cannot be obtained, except by a tedious process of crystallization and recrystallization, or by dissolving in alcohol, and thus separating it from those impurities insoluble in that menstruum, but this is an element in the process which as it adds very materially to the cost and is to a great extent unnecessary, will not be generally adopted.

For the preparation of the compound under consideration, we use a glass flask, capable of containing six imperial pints, and having filled it to within a sixth of its capacity with distilled water, previously boiled and cooled, pour out into a bason so

much as to leave the flask half-full: our reason for this is, that we may have a measure of the quantity of water for dissolving the alkaline carbonate, so that we may be able to pour the solution into the flask at once, and without hesitation.

The carbonate of potash we use is prepared by heating to redness crystallized bicarbonate of potash, so as to expel the excess of carbonic acid; but as it is most important that we should use a pure salt, we test its purity, before considering it fit for our purpose; having therefore, dissolved thirty or forty grains in distilled water in a test glass, and acidulated with an excess of nitric acid, we add first nitrate of silver and then nitrate of baryta, or chloride of barium. If these merely produce an almost imperceptible haze we do not consider the salt unfit for the end in view; but if the reaction be more decided we reject the specimen as altogether unfit for our purpose; if the solution of a fresh portion stand these tests, after neutralizing with ammonia the excess of nitric acid previously added, it will be still more suited to the proposed end.

The Edinburgh College orders a pure carbonate prepared from cream of tartar by ignition; and Dr. Christison, in his Dispensatory, supports it in this preference, for the alleged reason that the carbonate prepared in this way is cheaper than that prepared from the bicarbonate; but this is not the case as may be easily proved by calculation. Thus, the equivalent of bicarbonate of potash is 100.39, that of the anhydrous carbonate is 69.27, consequently 16 ounces of the first by ignition produce 11.04 ounces of the second. Again, as the equivalent of the acid tartrate of potash is 189.11, one pound of this on being ignited cannot produce more than 5.86 ounces. Now, since 11.04 ounces of carbonate obtained from sixteen ounces of the bicarbonate cost 1*s.*, which is about the price per pound of the latter, a pound will cost 1*s.* $5\frac{1}{2}$*d.*; whereas one pound of cream of tartar at 10*d.* per pound, producing only 5.86 ounces of pure carbonate, each pound of it obtained in this way must cost 2*s.* 3*d.*, being $9\frac{1}{2}$*d.* per pound dearer than that obtained from the bicarbonate; besides, the time and trouble required in preparing a pure salt from cream of tartar is very much greater than when the bicarbonate is used. For these reasons, when we can obtain a pure bicarbonate we use it in preference.

Having proved its purity, we put $7\frac{1}{4}$ ounces troy, reduced to coarse powder, into a crucible, and heat it for about half an hour at a low red heat, and after it has cooled sufficiently, weigh out four ounces and dissolve in the water poured from the flask into the bason, and the rest in two or three ounces of hot water in a test glass or phial.

Previous to this we have prepared the solution of iodide of iron, for this purpose we add nine ounces troy of iodine to the water in the flask, and then three ounces troy of pure iron filings, the iron being in the same proportion to the iodine as in the formula of the London college; frequently a much larger proportion than this is recommended, so much even as double the weight of iodine, but the above proportion is fully sufficient and no useful end can be obtained by using more.

The action resulting from the contact of the iron and iodine having ceased after brisk agitation, we take advantage of the heat produced and immediately raise it to the boiling point over a rose gas-burner, or in any other convenient way: we stop the ebullition when the froth becomes white, and allow the liquid to cool down to about 100° Fahr., when we immediately pour in the solution of carbonate of potash contained in the bason and mix by agitation, taking care to remove the hand occasionally from the mouth of the flask, to allow of the escape of carbonic acid which is slowly given off; in doing so the operator must be careful to give vent to the pent-up gas on the side of the flask farthest from his person, otherwise he will run the risk of having his clothes disfigured with red stains from the ferruginous liquid.

If the mixture be made at a somewhat higher heat, the escape of gas is so rapid, that there is great danger of the liquid boiling over and thus leading to considerable loss; on the other hand, if the solutions be mixed at a lower temperature, the precipitate is very slow of subsiding, and this interferes with and retards the process.

We now fill up the flask to the commencement of the neck with distilled water recently boiled, agitate and set aside to allow the precipitate to settle; our reason for filling up the flask to its narrowest part is, that as small an extent of surface as possible may be presented to the decomposing action of the air.

We have now in the flask a solution of iodide of potassium, with an excess of iodide of iron, together with a bulky white precipitate of protocarbonate of iron.

To neutralize the excess of iodide of iron either of two methods may be adopted: we may at once proceed to neutralize the excess by adding gradually, the solution of the carbonate from the test glass, agitating after each addition, until the liquid restore the blue colour to litmus reddened with a single drop of muriatic acid to about six ounces of water. This can be easily managed by dipping the point of a glass rod into the mixture in the flask, and then applying it to one of a number of small slips of the paper placed by the side of the operator. We give the preference to the other method.

After the precipitate has sufficiently settled to give a clear liquid, we pour in a little of the solution of the alkaline carbonate, and as there is an excess of the iodide of iron, a white precipitate is immediately produced. We now agitate the flask briskly to mix the solutions thoroughly, and likewise that the heavy sediment may envelope the very light precipitate last produced, and carry it down quickly, so as to leave the liquid clear, otherwise the liquid would remain thick and cloudy for a very long time.

By proceeding as directed, the liquid, in a few minutes, becomes quite transparent; we then add more alkaline solution, and proceed as before. We continue adding the solution, but more cautiously towards the end, till no re-action is produced on a fresh addition.

After complete subsidence of the sediment, we pour off the liquid into an evaporating basin, and press the precipitate strongly in a cloth; we then break up the mass in about six ounces of distilled water, press again, and add the liquids to that already in the basin, and evaporate till near the point of crystallization.

We may here remark, that we prefer pressing through a cloth, to the tedious process usually recommended of washing the precipitate on a filter, with an abundance of water, till every trace of iodide be removed from it, and thus increasing unnecessarily, and to a large amount, the quantity of liquid to be evaporated; and we feel persuaded that we will be supported in our view of this matter by every practical man, and for the following reason:

After pressing strongly the precipitate, there is not at the most more than an ounce of liquid left; and as the whole amount of liquid was six pints, or 120 oz. and contained in solution 11.8 oz. or 5664 grains of iodide, there could only be the 1-120th of that quantity in what was left, that is 47 grains; but as the precipitate was diffused through six oz. of water, the whole seven oz. would contain no more than 47 grains; and on again pressing, only the seventh part would be left behind, which is somewhat less than seven grains.

A moment's consideration will show, that the value of this could never compensate for the time spent and fuel consumed in filtering and evaporating three pints of liquid, which is the amount ordered by the London College for the quantities used in our process.

To return from this digression: having concentrated the solution to the extent mentioned, it will be found almost invariably that the liquid shows a strong alkaline re-action, for however carefully the alkaline solution may be added, it is almost impossible to avoid an excess, this excess must therefore be

remedied, and the method we adopt for this end is the following :—

We prepare, in a Florence flask, a solution of iodide of iron, from ʒiij iodine, ʒj iron filings, and ʒvj of water, with this proportion of cold water the action goes on with perfect safety, but with very little less the heat developed is so great that the liquid almost instantaneously enters into uncontrollable ebullition, and the whole contents of the flask are expelled with a sort of explosion. In using the proportions we have adopted, the heat produced is nearly sufficient to bring the solution to the boiling point, so that a few minutes application of the gas-flame renders the liquid sufficiently clear.

We do not think it useless to remark here, that the cautions commonly given, not to apply more than a very gentle heat, do not appear to us to be well grounded, and proceed from a needless fear of the loss of iodine; the attraction of iron and iodine in the presence of water is so energetic that they combine almost instantaneously; and after the action the quantity of iodine, in a free state in the liquid, must be very small; and we should conceive that there is less likelihood of a loss of iodine by applying the heat rapidly than otherwise, inasmuch as the currents in the liquid are rendered more rapid, and thus every point is brought successively in contact with the iron diffused in this way through the fluid; and, in our opinion, the clearing of the liquid results more from the action of the iron than the expulsion of free iodine by the heat. At any rate, however rapidly heat may be applied, there is very little escape of iodine, and we never found that we obtained a less quantity of iodide of potassium when a quick heat was used than when it was more gentle.

Having now prepared a strong solution of iodide of iron, which is done in a few minutes, we allow it to settle a little, then pour it into a phial from the sediment without filtration; about an ounce of water may then be poured into the flask and the sediment washed with it, and, after subsidence, poured into the concentrated solution of iodide of potassium. We now continue adding gradually more from the phial, till the liquid ceases to restore the blue colour to reddened litmus.

After heating to aggregate the precipitate, we filter the liquid, washing the precipitate properly, for this purpose we use a double filter, the liquid being so dense that a single one would inevitably give way under its weight, unite the liquids and evaporate to dryness, and fuse the dry salt in an iron pot provided with a cover, the fusion may be easily accomplished with a brisk open fire, and care must be taken not to continue the heat a single instant after complete fusion has been effected.

Without the application of a heat sufficient to fuse the iodide,

we cannot without great difficulty obtain it free of colour, probably arising from excess of iodine, and possibly organic matter, but in this way they are both completely removed.

By dissolving out the iodide and filtration we get a perfectly colourless solution, and by successive concentration and cooling we obtained a perfectly pure and colourless iodide nearly to the very last.

Whenever the crystals begin to show the presence of impurities, which can be easily known by the form and appearance they present, or their partial solubility in alcohol, we evaporate to dryness and purify the residuum with alcohol, or reserve it for this purpose till a sufficient quantity is collected.

We obtain the iodide of potassium in beautifully regular crystals, by covering the basin, after due concentration, with a plate, which prevents rapid evaporation from the surface, and the consequent formation of a crust, placing it on a bad conductor, such as a piece of charred wood, and surrounding the whole with several folds of a dry cloth, formed of some good nonconducting substance, in this way the liquid cools very slowly and allows time for the solid particles to arrange themselves in a regular manner.

A saturated alcoholic solution of the iodide, which had been used for its purification, after standing aside for about twelve months in a bottle loosely corked, had deposited, at the bottom of the bottle, a mass of loose acicular silky crystals.

It is almost invariably asserted in chemical works, that the iodide is a deliquescent salt, this is not the case when it is prefectly pure and free from excess of the very deliquescent carbonate of potash. We have kept a pure specimen crystallized from alcohol in an open dish, exposed to all conditions of the atmosphere for weeks, without appearing damper than when just taken from the stove.

The Chairman thought there were some points in the paper of Messrs. Smith which might probably give rise to discussion, and he hoped that any Members present, who might have had experience in the subject, would favour the meeting with their opinions, one of the objects of reading papers being to elicit as well as to convey information.

Mr. Redwood observed, that the authors of the paper appeared to be in error, in supposing that the "pure carbonate of potash" was ordered by the Edinburgh College to be used in making the iodide of potassium. The carbonate of potash of the Edinburgh Pharmacopœia is the carbonate of potash of commerce, and this is the substance ordered in the process for iodide of potassium.

The pure carbonate was stated to have been introduced into the work merely as a test. Mr. Redwood thought the addition of a small quantity of iodide of iron, towards the close of the process, to saturate the excess of alkali, involved unnecessary trouble and expense; and suggested, that hydriodic acid, which might be prepared with equal facility, would answer the purpose as well, and would obviate the necessity of filtration, fusion, and solution in spirit.

Several specimens of iodide of potassium were on the table; some of which had the usual opaque appearance, while others, and one in particular, were nearly if not quite transparent.

An enquiry having been made respecting the cause of this difference,

Mr. Davy stated, that when in a state of absolute purity, he believed it was usually transparent.

Mr. Fownes observed, on the other hand, that he had prepared some of this salt with very great care, and was satisfied of its purity, but that it, nevertheless, was opaque.

SOME OBSERVATIONS ON POTATO-STARCH.

BY JONATHAN PEREIRA, M.D., F.R.S.,

Honorary Member of the Pharmaceutical Society.

I VENTURE to call the attention of the Members of the PHARMACEUTICAL SOCIETY to some of the properties and uses of *Potato-Starch*. I do so because I find, that while this fecula is extensively used for adulterating dietetical and pharmaceutical substances, and is sold in the shops under various names, many intelligent Chemists and Druggists are unacquainted with it, and, therefore, are unable to recognise it when met with.

At some of the Italian warehouses in London it is sold under the name of *Potato-Flour;* being used by cooks in the preparation of soufflés, and sometimes for thickening gravies, sauces, &c., on account of its being cheap, tasteless, and soluble.

At Mr. Butler's, in Covent Garden market, it is sold in tin-canisters, under the name of *English Arrow-root*, and is used as a farinaceous food for infants and invalids, as well as for the preparation of puddings.

Bright's Nutritious Farina is a carefully prepared potato-starch, very slightly coloured and aromatized. It is used for the same purposes as the preparation last referred to; it makes very agreeable puddings.

The powder sold as *The Prince of Wales' Food*, prepared by the *Patent Farina Company*, is potato-starch.

In High Holborn there is an establishment professing to sell *Indian Corn-starch*. On examination I find that the substance

sold under this name is potato-starch, to which a blue tinge has been communicated, probably by indigo. The naked eye is sufficient to recognise it. By the microscope, the shape and size of the grains, which are very different to those of the real fecula of maize or Indian corn, readily distinguish it as potato-starch. This fact I pointed out to Professor Brande, who having satisfied himself of its accuracy, mentioned it in a lecture at the second evening meeting of the Royal Institution this year.

The powder sold as *Anderson's Soluble Starch*, is identical with the so-called Indian corn-starch; in other words, it is coloured potato-starch.

Bright's Universal Sanative Breakfast Beverage is a mixture of potato-starch and chocolate. To the latter substance it owes its colour, odour, and flavour. When prepared for use, with either water or milk, it forms a thickish liquid.

I may here observe, that chocolate is very frequently admixed with farinaceous substances, which give it the property of thickening either water or milk; and though some persons may think this a good quality of chocolate, it is usually considered as a sign of adulteration.

Potato-starch is sometimes used for adulterating other substances. Thus it is stated to be frequently mixed with *West Indian Arrow-root;* but I have never met with this sophistication.

An imitation *Sago* is sometimes prepared with it. Two samples of this kind I have placed on the table of the Society. Both consist of white granules—much whiter than the ordinary pearl-sago. But I find that genuine pearl-sago may be rendered perfectly white by a solution of chloride of lime; and I have been informed that some of the wholesale dealers are in the habit of getting it bleached. Hence, therefore, the whiteness of sago is no criterion of its being adulterated. Of the two samples of potato-sago, now on the table of the Society, one was sent from Paris by Professor Guibourt, who informs me, that it was manufactured in the neighbourhood of that city. The grains of this specimen are much larger than those of pearl-sago; moreover, they are regular and perfectly white. The other variety of potato-sago I purchased in this country. By the naked eye it is undistinguishable from genuine pearl-sago, except in being whiter than the latter usually is.

The great similarity which exists between potato-starch and *Tous les mois*, leads me to suspect that the former is sometimes substituted for the latter by dealers.

Potato-starch is extensively used in this country in the manufacture of *Potato-Sugar*, which is employed by fraudulent grocers for mixing with the common brown cane-sugar of the shops. On

a future occasion I propose to lay before the PHARMACEUTICAL SOCIETY some remarks on this substance.

The substance called *dextrine* is usually procured from potato-starch. It is a gummy substance, having exactly the same composition as starch, and is soluble in both cold and hot water. It might with great propriety be termed *starch-gum*, but it has been called dextrine on account of its solution possessing the property of effecting the right-handed rotation of the plane of polarization of a ray of light. Dextrine is prepared either by torrifying potato-starch, or by the action of heat aided by a minute portion of nitric acid. The latter method yields the most soluble and least coloured product. In the process of panification, a portion of wheat-starch is converted into dextrine (torrified or gummy starch); of which, according to Vogel, wheat-bread contains about 18 per cent. In the process of brewing, the starch of the malt is converted into dextrine and sugar by the action of diastase. Dextrine, in the form of a syrupy liquor obtained by means of diastase, is employed, in Paris, in the preparation of some alimentary substances; as for sweetening and thickening *tisanes*, and for the manufacture of the *pains de luxe* or *dextrine bread*. Pulverulent dextrine, of which a sample is placed on the table of the PHARMACEUTICAL SOCIETY, is used, as a substitute for gum, in calico-printing and for a variety of other useful purposes. Bandages for fractures are sometimes impregnated with a solution of it. When dry they maintain, in a proper position, the fractured limb on which they are moulded.

Hitherto I have said nothing as to the mode of detecting potato-starch, I now proceed to offer a few remarks on this point.

It may be readily distinguished by the naked eye of an experienced person from all other commercial feculas, *tous les mois* alone excepted. It presents a remarkable glistening, satiny, pearly, or sparkling appearance, somewhat like that of a number of minutely divided globules of mercury. Though it is difficult to convey an accurate and precise idea of this property by words, yet it is one which is instantly recognised when a sample of this starch is attentively examined. It arises from the large size of the amylaceous grains. Moreover, potato-starch wants that dull or dead white appearance presented by West Indian arrow-root. It gives the idea of the particles being slightly translucent.

In the large size and slight translucency of its grains, *tous les mois* agrees with potato-starch: indeed, they are somewhat larger than those of the latter starch. Hence, therefore, the naked eye may confound these two feculas.

The microscope is the most important agent in distinguishing the different starches from each other; and by it we can readily

detect potato-starch. We recognise it by the *size*, *shape*, and *structure* of its grains. Though the *size* varies somewhat, yet on the average it exceeds that of other commercial starches, always excepting *tous les mois*, whose grains, as I have already stated, are rather larger. I have, however, occasionally met with samples of potato-starch, whose grains nearly equalled in size those of *tous les mois*. The actual size of the grains varies from $\frac{1}{600}$th to $\frac{1}{30}$th of a line in diameter. The *shape* of small (or youngest ?) grains of potato-starch is circular or globular: but that of the larger ones is elliptical, oblong, ovate, or obtusely triangular. Perhaps, we may assume that the normal form of the fully developed particles is ovate. The *structure* of the grains is the next point deserving of our attention. When examined by a polarizing microscope, we observe, by the black cross which they present, that they possess a depolarizing or doubly refracting structure, which is to be regarded as an indication of their consisting of a structure unequally dense. By the common microscope we discover, on some part of the surface of the grain, one hilum, or, in some cases, two hila—one at either end, or two at the same end. The hilum is a circular hole, which was formerly thought to be a kind of umbilicus, by which, according to some writers, the starch-grain was originally attached to the parent vesicle in which it was developed. It is now regarded as the circular section of the tube or passage by which the amylaceous substance is introduced into the interior of the starch grain. On large and old grains of starch we observe a number of cracks which commence at the hilum.

On the surface of the grains is a series of curved lines, forming a system of either concentric or excentric rings or zones, which surround the hilum. They are similar to the curved lines observed on bivalved shells, as the mussel, and which indicate the terminations of the successive layers of which these shells are composed. The grains of every kind of starch, which I have hitherto examined, present a hilum and some traces of rings; but in the smaller grained starches, as rice-starch and the Portland arrow-root (starch of *Arum maculatum*) they are very imperfectly perceived. *Tous les mois* and potato-starch, probably on account of the size of their grains, show these rings in the most distinct manner.

The starch grains are composed of a series of juxta-posed concentric layers, which may be compared to the laminæ of an onion. Of these layers, the innermost are the most recently formed. The composition of all of them is the same, but their cohesion is different, the inner or younger ones being less cohesive, and, therefore, more readily soluble than the outer or older ones. The rings or rugæ so distinctly perceived on grains of potato-starch, depend on the concentric layers.

I am acquainted with no absolute chemical test by which potato-starch can be certainly distinguished from other starches. All the amylaceous substances possess certain chemical characters in common, one of the most remarkable and striking of which is, that of forming with iodine a blue compound. But these characters are possessed in unequal degrees by different starches, and thus the chemical peculiarities of potato-starch are rather differences in degree than absolute and positive distinctions. Its greater solubility in boiling water serves to distinguish it from wheat-starch, and hence it is frequently called, in contradistinction to the latter substance, *soluble starch.*

How then, it may be asked, is it that potatoes by boiling do not yield a mucilage of starch? The answer is, that the starch grains are contained in vesicles which compose the cellular tissue of the potato, and that the membrane of which the vesicle is composed, is not soluble in water. Moreover, it is to be remembered, that these vesicles contain an albuminous liquor in which the starch grains are immersed, and that by heat the albumen of this fluid is coagulated, and thus probably the starch grains become enveloped by a thin film of coagulated albumen, which is insoluble in water.

The greater facility with which potato-starch gelatinizes when rubbed in a mortar with a mixture of equal parts of commercial hydrochloric acid and water, has been recently suggested as a means of detecting it when mixed with rice-flour. The strong smell of formic acid emitted by it, when rubbed with hydrochloric acid, has also been proposed to characterize it.

Commercial potato starch contains about 18 per cent. of hygrometric water.

Potato-starch is manufactured in this country, and is also extensively imported from Normandy and Guernsey. A few months since I visited a large manufactory of it at Stratford, in Essex, where it was at that time made from that variety of the potato, called *Shaw's*, and which I was informed gave the largest product. After being washed in a large tub, by an agitator moved by steam-power, the potatoes were ground to a pulp, which was conveyed, along with water, into a large sieve, in which a number of brushes were kept revolving, which brushed the starch through the sides of the sieve. The liquor, holding the starch in suspension, was conveyed into backs, where the fecula was allowed to deposit.

The pulp, thus deprived of its starch, was removed by a conveyance called a Jacob's ladder, from the sieve into a yard, where I observed extensive heaps of it undergoing decomposition, and I was informed that hitherto it had not been applied to any useful purpose. It occurred to me that it would serve as an excellent manure, especially for lands on which potatoes were

grown, since it would supply the salts necessary for the growth of these plants. I am ignorant whether any trial of it has been made.

Whether starch can be extracted from potatoes by the action of a weak solution of caustic alkali (soda) I know not; but it would appear, from an observation in Mr. Orlando Jones's specification of his patent for the manufacture of rice-starch, by means of caustic alkaline solutions, that it cannot, for he says, that he has not yet found that his "invention can be applied with advantage in the manufacture of starch from potatoes."

The quantity of starch obtained from potatoes is subject to considerable variation, as the following table shows:

QUANTITY OF STARCH OBTAINED FROM POTATOES.

100 *Parts.*	*Quantity of Starch.*	*Authority.*
Kidney Potato	28 to 32	Dr. Pearson.
Apple Potato	18 to 20	Sir H. Davy.
Potato, *var.* Shaw	18.8	Vauquelin.
——— Champion	15.9	Ditto.
——— Chair rouge	12.2	Ditto.
——— L'Orpheline	24.4	Ditto.

In manufactories the maximum quantity of starch obtained rarely exceeds eighteen per cent; and it deserves especial notice, that frosted potatoes yield as much fecula as those which are unfrosted*.

THE BENEVOLENT FUND.

The Council of the Pharmaceutical Society, being anxious to carry out the recommendation of the previous Council in reference to the Benevolent Fund, think it right to make a general appeal to the Members and Friends of the Society on behalf of this important object. A list of the sums already received is on the Cover; and those who may feel disposed to contribute further Donations or Annual Subscriptions, are requested to forward the same to the Secretary, Mr. Smith, 17, Bloomsbury Square.

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* Girardin, *Journal de Pharmacie*, t. xxiv., p. 301. 1838.

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Mr. Alexander Bottle, *Dover.*—Sphæria Robertsii from New Zealand.

REMARKS ON THE PHARMACOPŒIA OF THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH,

AND ON

DR. CHRISTISON'S DISPENSATORY, OR COMMENTARY ON THE PHARMACOPŒIAS OF GREAT BRITAIN.

BY RICHARD PHILLIPS, F.R.S., &c.,
Honorary Member of the Pharmaceutical Society.

[*Continued from Vol. II. p.* 720.]

Acidum Citricum is the preparation which I shall next notice. I showed in the *Medical Gazette*, that the Edinburgh College, forgetting their diluted sulphuric acid is weaker than that of the London College, ordered half a fluidounce less for the decomposition of the citrate of lime, instead of directing, as they should have done, nearly eight fluidounces more. This mistake is now corrected.

Among the tests for ascertaining the purity of citric acid, both Colleges state, that it should be almost entirely dissipated by exposure to the action of heat; and the direction of the Edinburgh College, to incinerate with the addition of a little red oxide of mercury, will probably accelerate the operation, and if so, it is an improvement.

In his remarks on the mode of preparing citric acid, Dr. Christison mentions, that ten parts of chalk are decomposable by nine parts of concentrated sulphuric acid. Now admitting the acid to be of the greatest possible strength, 9.8 parts will be required; and if of the density of 1840 only, as stated in the Materia Medica, 10.2 parts of it will be necessary.

With respect to the quantity of citric acid yielded by a given quantity of lemon-juice, Dr. Christison appears to me to have fallen into a great mistake; he says, that "one hundred and sixty pounds of good lemon-juice, yield ten ounces only of pure acid." It is putting the most favourable construction on this assertion to suppose, that the weights mentioned, both with respect to the raw material and the product, are troy weight. Now, taking the specific gravity of lemon-juice, as I have found it, at 1044, 160 troy pounds measure about 100 pints, requiring 112 ounces of chalk for their saturation, and the same weight of sulphuric acid for decomposing the citrate of lime formed; but 112 of chalk are equivalent to 156 of crystallized citric acid, and making a liberal allowance for malic acid, and for loss in the operation, 146 out of 156 ounces is much too large a proportion to be lost; I cannot, therefore, help suspecting, that *ounces* have been accidentally inserted instead of *pounds*, for the sulphuric acid and chalk, low-priced articles as they are, would cost about

as much as the citric acid produced would sell for in the market, if ten ounces were the whole quantity obtained.

Acidum Hydrocyanicum.—In a passage quoted in my last communication, Dr. Christison observes, that the London College, "with a disregard of correct nomenclature," have given the name of Acidum Aceticum "to a weak acid, about the density of 1050, containing not much above a third of its weight of the pure acid of the Edinburgh Pharmacopœia."

If the appellation of acidum aceticum is improperly bestowed, on a preparation containing 30 per cent. of acid, where is the consistency of giving the name of Acidum Hydrocyanicum to a solution containing only 3.3 per cent. of that acid?

The Edinburgh College have adopted the London process of obtaining hydrocyanic acid by decomposing ferrocyanide of potassium with diluted sulphuric acid, with the difference, however, that they have quite needlessly increased the proportion of sulphuric acid. In the first edition, indeed, the relative quantities were 4830 parts of sulphuric acid to 1440 of the ferrocyanide, a quantity sufficient for about 7000 parts, or nearly five times too large; having, however, subsequently learned, what was previously well known to others, that the excess of sulphuric acid "must not be large, otherwise farther decompositions are effected, and, among other products, formic acid is apt to be produced" (Dispensatory, p. 23), the College have reduced the sulphuric acid to 1610 parts, which is still so large that there is yet great risk of the production of formic acid.

"The proportion of sulphuric acid recommended by the Colleges of London and Edinburgh," Dr. Christison remarks, "is a trifle more than what is sufficient to produce bisulphate of potash in the residuum." It would be natural to conclude, from this statement, that the Colleges employ nearly similar proportions of sulphuric acid, which, however, is very far from being the case—the London College using an ounce and a half of acid to two ounces of the ferrocyanide; and the Edinburgh, two fluidounces of acid to three ounces of the salt; the quantities of acid for equal quantities of ferrocyanide being to each other about as 108 to 160.

Mr. Everitt has shown, that six equivalents, or 294 parts of sulphuric are required to decompose 2 equivalents, or 426 parts, of ferrocyanide of potassium, and, among other substances, there are produced 3 equivalents of bisulphate of potash; the proportions used by the London College are 319 of acid to 426 of ferrocyanide, which certainly are but little more than requisite to produce 3 equivalents of bisulphate; but the proportions of the Edinburgh College are, 476 of sulphuric acid to 426 of ferrocyanide, or sufficient to produce somewhat less than 5 equiva-

lents of bisulphate of potash, instead of only a *trifle more* than three.

After giving Mr. Everitt's view of the nature and results of the decomposition of ferrocyanide of potassium by sulphuric acid, Dr. Christison states, that "the proportions in the Edinburgh formula ought to yield, according to Mr. Everitt's theory, 245 grains of pure hydrocyanic acid, or about 16.8 fluidounces of medicinal acid, containing a thirtieth of pure acid."

To enable the reader to estimate the quantity of hydrocyanic acid obtainable from ferrocyanide of potassium, we may as well point out its composition, which is

Three equivalents of		Cyanogen	78
One	"	Iron.....	28
Two	"	Potassium	80
Three	"	Water	27
			213

According to Mr. Everitt's statement, admitted both by Dr. Christison and myself to be accurate, one-half of the cyanogen is convertible into hydrocyanic acid, consequently one equivalent of the salt=213, will yield one and a half equivalent of the acid; it follows, therefore, that three ounces, or 1440 grains, the quantity directed in the Edinburgh formula, should afford, theoretically, 274 grains instead of 245, as inferred by Dr. Christison; and when "diluted with about 30 parts of water," should produce more than 19 fluidounces of medicinal acid, instead of 16 only, which Dr. Christison says he has repeatedly obtained, and found to possess the required strength.

I am ready to admit that, although the *theory* of the production of only 16 fluidounces is erroneous, the *fact* of their production may be correctly stated, for, as already mentioned, the excess of sulphuric acid employed may have produced formic acid.

I may as well take this opportunity of pointing out a mistake into which Dr. Christison has fallen, in stating the composition of ferrocyanide of potassium. (Dispensatory, p. 749). He says, "the most generally received doctrine regards it as a compound of two equivalents of potassium, and one equivalent of cyanide of iron, with three equivalents of water of crystallization (2 K Cy+Fe Cy+3 Aq) and consequently of 39.15 parts of potassium, 79.17 cyanogen, 28 iron, and 27 water." It is evident 39.15 represent only one equivalent of potassium instead of two equivalents, or 78.30.

With respect to the theory of the production of hydrocyanic acid from bicyanide of mercury, Dr. Christison observes, that when this salt is acted upon by dilute hydrochloric acid "water is decomposed and oxide of mercury formed, which unites with the muriatic

acid to constitute hydrochlorate of the peroxide of mercury; while hydrocyanic acid, formed by the disengaged cyanogen and hydrogen of the water, distils over along with watery vapour." In page 516, the terms corrosive sublimate, bichloride of mercury, oxymuriate of mercury, and corrosive muriate of mercury are given as synonymous; but no such name as hydrochlorate of peroxide of mercury is mentioned. Indeed, the correct explanation which Dr. Christison gives of the production of this compound by the action of mercury, common salt, oxide of manganese, and sulphuric acid on each other, excludes both hydrogen and oxygen from its composition, and consequently proves that it contains neither hydrochloric acid nor peroxide of mercury: he says "in this process two equivalents of chlorine are disengaged by the action of the sulphuric acid on the salt and oxide of manganese; and the chlorine in its nascent state, coming in contact with the mercury, it unites with one equivalent of the metal, so that bichloride of mercury [not *hydrochlorate of peroxide of mercury*] is at once formed." The true explanation of the production of hydrocyanic acid by the action of hydrochloric acid on bicyanide of mercury, and that consistent with the fact of corrosive sublimate being bichloride of mercury is this: when hydrochloric acid and bicyanide of mercury are heated together, both are decomposed, the hydrogen of the acid unites with the cyanogen of the mercurial salt to form hydrocyanic acid, while the chlorine and mercury combine and yield bichloride of the metal.

In concluding my remarks on hydrocyanic acid, it is but doing justice to the Edinburgh College to state, that the formula of the first edition of the Pharmacopœia, was not altered in the second in consequence of any remark of mine. The wonder is, *not* that an alteration should have been made in the formula, but that the error requiring it should have been committed.

Acidum Muriaticum.—This acid is introduced under three forms:—"ACIDUM MURIATICUM. *Hydrochloric acid of commerce,*" "ACIDUM MURIATICUM PURUM. *Hydrochloric acid,*" and "ACIDUM MURIATICUM DILUTUM."

The College having adopted the name of Acidum Hydrocyanicum, it would have been more in keeping to have called Acidum Muriaticum, Acidum Hydrochloricum Purum, and to have explained Acidum Hydrochloricum to be Muriatic Acid of commerce, for the term Hydrochloric Acid is not employed in commerce. In the first edition, bromine was stated to be one of the impurities of the commercial acid, but this is now omitted, and sulphurous acid, one of its most common admixtures, is not named as such. In the *Medical Gazette* both these subjects were alluded to by me. The density of commercial muriatic

acid is stated to be at least 1180; I have never found it nearly so strong, and I repeat what I mentioned in the *Medical Gazette*, that any muriatic acid of this specific gravity must probably contain a very large admixture of sulphuric acid. After all, as economy must be the only motive for using muriatic acid, containing sulphuric acid, sulphurous acid, chlorine and oxide of iron, what can be the amount of saving when the pure acid may be bought for sixpence per pound!

Acidum Muriaticum Purum.—The directions for preparing this are as follow: "Purify Muriate of soda by dissolving it in boiling water, concentrating the solution, skimming off the crystals as they form on the surface, draining them from the adhering solution as much as possible, and subsequently washing them with cold water slightly. Take of this salt, previously well dried, of Pure sulphuric acid, and of water, equal weights. Put the salt into a glass-retort, and add the acid previously diluted with a third part of the water and allowed to cool. Fit on a receiver containing the rest of the water. Distil with a gentle heat by means of a sand-bath or naked gas-flame so long as any liquid passes over, preserving the receiver constantly cool by snow or a stream of cold water."

Until Dr. Christison's Dispensatory appeared, I was not aware of the reason for which purified common salt is directed to be used in the above formula; in this work we find it stated, that "all the colleges have a formula for preparing pure muriatic acid; but that of the Edinburgh is the only one which will yield it of perfect purity. Muriate of soda, as met with in commerce, almost always contains more or less nitrate of soda, and sometimes a considerable proportion." "Another neglect on the part of the London and Dublin Colleges, if their object be to obtain a pure product is, that they do not direct the sulphuric acid to be freed of [from] nitrous acid."

I know not on whose authority this statement of the usual existence of nitrate of soda in common salt is made. I have consulted nearly thirty authors and not one of them mentions it. Nor, as far as I have been able to discover, does any analyst mention nitrate of soda, or any nitrate at all, as existing either in rock salt, salt springs, or sea-water; and yet it is from one of these sources that common salt as met with in commerce is procured. Thus, in the *Phil. Trans.* for 1810, Dr. Henry published the analyses of eleven varieties of British and foreign salt: in the 2d Vol. of the *Geological Transactions*, Mr. Horner has given analyses of the salt springs of Droitwich; Dr. Murray analysed the water of the Firth of Forth, and Dr. Schweitzer that of Brighton, and yet no one of these analysts has mentioned the existence of any nitrate. Dr. Marcet, indeed, expressly says,

that sea-water does not contain any nitrate, and he examined fourteen different specimens.

I think it possible, however, that the refuse salt, which remains after the purification of nitre, may have been examined and found to contain a little nitrate, and this may have given rise to the idea, which is certainly an erroneous one, that nitrate of soda is usually to be found in common salt.

With respect to the purification of sulphuric acid, on account of the nitrous acid which it is supposed usually to contain, I must say, that I never met with it but once; but even supposing it to be a more common admixture than I believe it to be, I am apprehensive that the mode of purification recommended by the College would be apt to introduce more sulphurous acid than it would remove of nitrous. For the method itself I refer to the Pharmacopœia.

In concluding I may observe, that I have found no difficulty whatever in obtaining, and I have now by me, hydrochloric acid as colourless as water, by using commercial acid and salt, without any purification being requisite or attempted.

Most particular as the Edinburgh College have been in giving directions for the preparation of pure muriatic acid, it appears as if it might have been as well omitted, and the cheaper commercial acid, impure as it is allowed to be, entirely substituted for it. Dr. Christison, indeed, admits that it is sufficiently pure "for all medicinal and most pharmaceutic purposes;" and, consistently with this declaration, I find that it is employed in six of the seven formulas in which this acid is used. Barytæ murias is the only preparation in which pure acid is directed, and it is that in which it is of least consequence to be so.

Acidum Nitricum. — Of this as of the muriatic acid there are three preparations in the Pharmacopœia, "ACIDUM NITRICUM. *Nitric acid of commerce.*" "ACIDUM NITRICUM PURUM. *Pure nitric acid.*" "ACIDUM NITRICUM DILUTUM." With respect to commercial nitric acid, the College in the first edition, directed it to be of "density at least 1380: colourless or nearly so: if diluted with distilled water, it precipitates but slightly, or not at all, with solution of nitrate of baryta, or of nitrate of silver." In the second edition we find "density 1380 to 1390," this alteration is of but little importance as the difference in strength of acid of these densities amounts to only about 1.5 per cent. of real acid.

Acidum Nitricum Purum.—I have already remarked in the *Medical Gazette* that the formula of the London College is adopted; this consists in submitting to distillation equal weights of sulphuric acid and nitrate of potash. Dr. Christison observes, that "in order to obtain a pure acid by this process the Edinburgh Pharmacopœia has annexed a condition which the two other Col-

leges have neglected, but which it is commonly essential to attend to. The nitre of commerce, usually found in the shops, is contaminated with a muriate, probably of potash; which will cause an impregnation of muriatic acid in nitric acid prepared from it. To prevent this the Edinburgh College directs repeated crystallization, till a solution of the salt no longer indicates the presence of muriatic acid when tested with nitrate of silver." Now, as regards the London College, this statement is incorrect, for under the head of *Notes* it will be seen to be directed, that from a solution of nitrate of potash, neither chloride of barium nor nitrate of silver precipitates any thing.

Acidum Nitricum Dilutum.—In the first edition, the directions were as follows:—"Mix together three fluidounces of Nitric acid (commercial) and four fluidounces of Water. If Pure nitric acid be used, four fluidounces of it must be mixed with six fluidounces of water. The density of this preparation is 1290."

I showed in the *Medical Gazette*, that it is by the latter process only, that dilute nitric acid of the required density is obtained: I found its specific gravity to be 1292 instead of 1290, and that it contained about forty per cent. of real acid, while, when the commercial acid was diluted with the quantity of water ordered, its density was scarcely 1190, instead of 1290, and it contained only 26.4 instead of forty per cent. of real acid, and consequently the difference between the strengths of these preparations, which ought to be of similar power, was as 66 to 100.

The Edinburgh College, in the second edition, have adopted dilute nitric acid of the same density as that of the London College, but prepared according to two formulas, one of which is similar to that of the London College, viz. by mixing a fluidounce of nitric acid of 1.5 with nine fluidounces of water. This mixture is stated to be of density 1077, I have found it to be 1080, the difference is trifling. In the other formula, one fluidounce, five fluidrachms and a half of commercial acid, are mixed with nine fluidounces of water. I have not prepared this mixture, but, from calculation, I find it to be very nearly similar in strength to that obtained with the strong acid. It would, I think, have been better if Dr. Christison had apprized his readers, that the present dilute acid is in strength, to that of the Pharmacopœia of 1817, only about as eleven to forty.

NAPHTHA.

Dr. Hastings has recently employed naphtha as a remedy in cases of phthisis, and some of our correspondents have requested us to inform them which kind of naphtha was thus used, as there are several substances known in commerce under that name.

The term *naphtha* was originally applied to a species of hydrocarbon, of a yellowish white colour, highly volatile and combustible, which exudes from the ground in certain localities in Persia, Italy, &c. This natural naphtha is somewhat similar in its nature to the substance known as Barbadoes tar, which is also a compound of hydrogen and carbon, and which rises in considerable quantity, in some springs of water, on the island of Barbadoes. The Barbadoes tar, or petroleum, although it has sometimes been designated as naphtha, differs from the last-mentioned, in being viscid and nearly black; but, by distillation, it yields a fluid, somewhat similar to the true natural naphtha. This distilled product was ordered to be used as a substitute for the natural naphtha in the Pharmacopœia Austriaco-Provincialis of 1774. After the adoption of the manufacture of gas from coal, it was found that the substance called coal-tar, one of the products of this manufacture, very closely resembled Barbadoes tar in its physical characters, and, for many years, coal-tar was almost entirely substituted for and sold under the name of Barbadoes tar in this country. Coal-tar also yields, by distillation, a volatile fluid, which has been called naphtha.

These bodies, to all of which the term *naphtha* has been applied, although differing from each other in some particulars, yet have one character in common, namely, that they are immiscible with water; and this character distinguishes them from other fluids which have been called by the same name.

In the process for obtaining acetic acid from wood, a volatile inflammable fluid is obtained, which Chemists have called pyroligneous ether, pyroxylic spirit, or hydrate of oxide of methule. This fluid is also commonly called naphtha, and being extensively used in the arts, the term naphtha is now more frequently, although incorrectly, applied to this than to any other body. This fluid very much resembles alcohol in some of its characters, and, among others, in its mixing in all proportions with water, although, in the state in which it is usually met with in commerce, it is contaminated with some oily matter, which occasions a milky appearance to this mixture. The difficulty of distinguishing these bodies, under certain circumstances, and some interesting facts connected with them, will be found noticed in a paper by Dr. Ure, recently read at a meeting of the Pharmaceutical Society, and published in this journal, p. 695.

Another volatile and inflammable fluid, closely resembling, and, indeed, not to be distinguished from, the last described, in its physical characters, is obtained by the destructive distillation of an acetate, as the acetate of lead or of lime. This product has been called by Chemists, pyroacetic spirit, mesitic alcohol, or acetone. It resembles alcohol more closely than

pyroxylic spirit, having nearly the same density, and is miscible in all proportions with water, without producing milkiness. This fluid is also sold under the name of Naphtha. It is applicable to most purposes for which pyroxylic, or wood-spirit, is used, and is often substituted for the latter. *This is the kind of naphtha which Dr. Hastings uses.**

Pyroxylic spirit and pyroacetic spirit, although they are both known in commerce, and used in the arts, under the name of naphtha, are not properly thus designated. They differ essentially from the natural naphtha to which we have alluded, the latter being a mere hydro-carbon, while the former contains oxygen.

Pyroxylic and pyroacetic spirit, have hitherto been sold as naphtha indiscriminately, there being no means generally known by which the one could be readily distinguished from the other. Dr. Ure has recently suggested an easy method of effecting this object, which is founded on the following facts. If nitric acid of specific gravity 1.45 be added to pyroxylic spirit, the mixture assumes a red colour, but no effervescence takes place. If the same acid be added to pyroacetic spirit, there will be no change of colour, but an effervescence will slowly be formed, accompanied with an elevation of temperature and copious evolution of gas, resembling in appearance the action resulting from the mixture of alcohol and nitric acid, but with an acetic smell instead of an etherous one. Pyroacetic spirit may also be generally distinguished from pyroxylic spirit by its causing no appearance of milkiness on mixing it with water, in the state in which it is met with in commerce. It is by this last criterion that Dr. Hastings has identified the kind of naphtha which he employs medicinally.

The application of the term *naphtha*, originally confined to a natural fluid production, of a volatile and highly inflammable nature, has been subsequently extended to several artificial products corresponding with the other in little else than the characters of volatility and inflammability; thus in addition to the cases already mentioned, we may further add, that in Germany the term naphtha has been applied to sulphuric ether, which, in the Wurtemberg Pharmacopœia of 1786, is called *naphtha vitrioli.* This ambiguity in nomenclature is to be deprecated.

PILULA FERRI COMPOSITA.

Several methods were proposed some time ago, by members of the society, for preparing this pill in such a manner as to preserve the carbonate of iron undecomposed, and to insure the

* It is sold by Mr. Cox, Bread Street Hill, Cheapside, and has been examined, at our request, by Dr. Ure.

uniform consistence of the mass.* Some of the plans recommended were, to a certain extent, deviations from the formula of the college. We have found, as the result of experiment, that the mass can be made according to the directions of the Pharmacopœia, and free from any of the objections which have been pointed out, by an attention to the following particulars :—

Dissolve the sulphate of iron, finely powdered, in the treacle, with a moderate heat, and add the carbonate of soda, stirring constantly until the effervescence has entirely ceased and the mixture has become cool ; then add the myrrh gradually and incorporate the mass. As a little evaporation takes place at the commencement of the process, a small excess of treacle is requisite to supply the deficiency. This mass retains its colour and consistence remarkably well.

EMPLASTRUM CERATI SAPONIS.

Although this plaster has for many years been extensively sold, spread on linen or calico, we have not seen any published formula for it, and the soap cerate being too soft for use as a plaster, several correspondents have enquired how they should proceed when emplastrum cerati saponis is ordered in a prescription.

The addition of one part of ceratum saponis to two parts of emplastrum plumbi, forms a plaster which, on an emergency, might be used in such a case, the article in question not being a preparation of the Pharmacopœia. But the most legitimate mode of reducing the cerate to the form of a plaster, is to continue the evaporation until all the vinegar is expelled. This method is adopted at the Army Laboratory, where the plaster is kept, not only spread as usual, but also in rolls like other plasters.

The following is the formula used at the Army Laboratory :—

Common vinegar (No. 24),	8 gallons, old measure.
White Castile soap.....	16lb.
Yellow wax	20lb.
Olive oil	32lb.
Litharge	32lb.

Boil the litharge with the vinegar almost to dryness ; remove from the fire and add the soap, previously scraped or cut ; replace on the fire, taking care to avoid empyreuma ; then add the wax and oil, melted and strained, and continue the evaporation, stirring constantly until the whole of the vinegar is expelled. The time required for completing the above quantity is three or four days.

The original recipe directed eight gallons of the residuum of distilled vinegar to be used instead of twenty-four gallons of com-

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* See *Pharmaceutical Journal*, vol. i, pages 172, 288, and vol. ii, page 9.

mon vinegar. The plaster thus prepared has a dark brown colour; but when the vinegar is used and the plaster has been carefully made, its colour is not much darker than that of adhesive plaster. The emplastrum cerati saponis extensum, as usually sold, is coloured artificially with burnt sugar.

HYDROSULPHURET OF AMMONIA.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—I have within the last few days been accidentally led to try the process for hydrosulphuret of ammonia, recommended in the April number of your journal. The object apparently is to get a protosulphuret of calcium, and then to decompose it by means of sulphate of ammonia, for the ingredients are all taken nearly in atomic proportions. The reaction might, if this were the case, be thus expressed:—Ca S and $N H_4 O, S O_3$ = Ca O, $S O_3$ and $N H_4 S$. But nothing of this sort occurs, because in boiling the lime with the sulphur, no protosulphuret of calcium is or can be formed, but (leaving out of the question a little hyposulphite of lime which is produced), the solution contains only a pentasulphuret of calcium, and consequently four-fifths of the lime are removed on filtration. The sulphate of ammonia being now added, in quantity equivalent to *the whole of* the lime, one-fifth only is decomposed, and the following reaction occurs:—Ca S_5 and $N H_4 O$, $S O_3$ = Ca O, $S O_3$, and $N H_4 S + S_4$, the product thus containing not only a great quantity of sulphate of ammonia in solution, but also a large excess of sulphur, much of which precipitates on dilution with distilled water, or even on standing twenty-four hours. These results I have obtained by experiment as well as theory, and yet the solution is described as "sufficiently pure for most experimental uses."

If this be submitted to distillation, as recommended where perfect purity is required, the sulphate of ammonia and excess of sulphur are got rid of, and the product $N H_4 S$ in solution is obtained sufficiently pure; but *this* is not the same thing as that obtained by passing sulphuretted hydrogen through solution of ammonia, which is now generally allowed by Chemists to have the formula $N H_4 S + H S$. In fact, the distilled liquid is precisely similar to that produced by the well-known old process of distilling together lime, sulphur, and muriate of ammonia, and known, when concentrated, as "Boyle's Fuming Liquid," which was constantly used as a test until recently superseded by the other preparation. The processes, too, differ only in this, that the *new* one substitutes sulphate for muriate of ammonia, and employs three operations where one only is necessary.

I am, Sir, yours, with great respect,

London, May 25th, 1843. W. B. RANDALL.

SPONTANEOUS COMBUSTION OF PYROTECHNICAL COMPOUNDS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—Observing a case of the above nature in the last number of the journal I am induced to communicate two recent instances. As the composition in these instances was different, perhaps, their insertion may tend to throw some light on the subject of spontaneous combustion.

The preparation was *purple fire*—composed of 5.0 chlorate of potass, 2.5 sulphur, 2.5 dried sulphate of copper, and 1.0 of dried nitrate of strontia. A few drachms of the above were mixed on the 22d of May, without any indication of reaction, beyond the usual peculiar smell, resembling that which generally accompanies the mixture of chlorate with sulphur. On the 25th of May, the mixture suddenly fired with a slight explosion, but fortunately, being in the day time, no damage was sustained.

As the sulphate was not so highly dried as usual (retaining a green tinge) the combustion was attributed to the water contained in it, which it was thought might facilitate the decomposition (by compound affinity) of the sulphate and chlorate, and thus generate sufficient heat to fire the remaining mixture of the chlorate and sulphur. To obviate this source of danger, the sulphate was a second time exposed to heat, on a piece of writing-paper, until it assumed a proper appearance, that of a grayish powder.

A fresh parcel of the fire was made on the 25th of May, which again fired on the 6th of June.

The question at once suggests itself, What is the cause of this ignition? I do not think that the nitrate of strontia had any thing to do with it in these instances; as red fire was prepared from the same parcel of nitrate of strontia on the 4th of November last, and remained in a willow-box, without the slightest alteration, until the 22d of May; and I have frequently kept both red and green fires for more than twelve months. It is right that I should mention, that the red fire alluded to, contained an equivalent of charcoal, instead of the sulphuret of antimony.

I beg to suggest two causes, which appear *together*, or, perhaps separately, fully adequate to account for the combustion.

1st. The sulphate of copper, or the nitrate of strontia, employed, may contain FREE ACID, which may cause the liberation of chlorine from the chlorate; which, in a nascent state, acting on the mixture of undecomposed chlorate and sulphur, may cause ignition in the same way as sulphuric acid is well known to do in similar mixtures. This view of the case seems strengthened by the carbonization of the paper containing the sulphate in the operation

of drying, as it took place to the extent of an inch all round—the other parts being scarcely altered. This, I think, may fairly be attributed to free acid in the sulphate becoming disengaged by heat, and acting on the paper.

2d. The combustion may have been caused by a similar state of the materials to that described (in the 2d volume of the Journal, page 364) for the preparation of oxygen gas; in which the action of metallic oxides on the chlorate of potass causes ignition of the mixture. It remains to be ascertained, whether the *sulphate of copper* and the sulphuret of antimony, would supply the place of the oxides of manganese or copper in the above experiments? and, whether the evolution of chlorine, from a mixture containing a free acid (such as I have suggested), would heat the mixture of chlorate of potass and oxide of manganese, sufficiently to cause ignition?

I have never heard of an instance of green fire igniting in this manner, although it contains an equal quantity of the chlorate. It contains from sixty to eighty per cent. of nitrate of barytes, which salt is nearly anhydrous, and of course less likely to contain any free acid; whereas in the requisite exsiccation of the nitrate of strontia, as usually met with, the smell of nitric acid is very perceptible.

I remain, yours, respectfully,

THOMAS ARNALL.

Pontefract, June 9th, 1843.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—In the number of your journal for this month, there is a short notice respecting the spontaneous ignition of coloured fires. Having given some attention to this matter, I beg to offer you a few remarks on the subject.

The common coloured fires consist of a mixture of nitrate of strontia (or baryta), chlorate of potassa, sulphur, &c. It is well known to pyrotechnists that these fires will "not keep." Now the cause of their "not keeping" and of their spontaneous ignition is precisely the same.

On burning a small quantity of these compositions, the sulphur in the mixture takes oxygen *rapidly* from the chlorate or nitrate, and is converted into sulphuric acid, which then combines with the baryta or strontia, forming a sulphate, which remains. Now the same action takes place *slowly*, as soon as the materials are mixed together (generally, however, without the evolution of much heat), the sulphur taking oxygen from the chlorate, forming sulphuric acid, and then combining with the baryta or strontia. This seems to be caused by the very strong affinity

which these two bases have for the acid, assisted by the low affinity with which the constituents of the chlorate are held together. I may mention that I have by me now, a quantity of what was once a coloured fire, but which has lain by for some time, and now contains scarcely a trace of the soluble salt. This explains the cause of the fires "not keeping."

Now if this action from any cause goes on very rapidly, it is attended with the evolution of considerable heat, sufficient, indeed, to inflame the whole mass; and we get, in fact, the spontaneous ignition referred to in your journal.

It is not so easy to ascertain exactly the causes giving rise to this excessive action—the following appear to have been the principal:

First, The state of division of the materials influences greatly the rate of action. In coloured fires, properly made, the ingredients are coarsely powdered, and thus present fewer points of contact. Now I have observed, that persons who have not had much experience in these matters, almost invariably *grind* the materials *very fine;* this of course increases the surface of contact, and the chemical action is proportionately active.

Pressure acts in the same manner, producing closer contact of the particles; or the action may be set up rapidly in one part, through the materials not being sufficiently mixed. The chlorate of potass, being thus left in larger quantity at one part, will afford a more liberal supply of oxygen to the sulphur there.

That the fault lies in the mixing, may be inferred from the fact, that you never hear of an instance of the spontaneous ignition of these fires amongst the firework-makers, though they make them in large quantities.

If you consider this explanation satisfactory, you will, perhaps, give a short notice of it in your journal.

I am, Sir, your very obedient Servant,

JOHN DALLAS.

June 1*st*, 1843.

EXTRACTED ARTICLES.

ON THE PREPARATION OF EMPLASTRUM PLUMBI.

BY OTTO ROHUKE.

MANY of the old Dispensatories order vinegar to be used in the preparation of lead plaster. Although this addition, considered, perhaps, to be useless, has of late years fallen very much into disuse, the author states that he has found considerable advantage in operating according to the ancient method, and recommends it to be again adopted. The following is the way in which he makes the *simple lead plaster*:—Put into a tinned pan nine pounds (troy) of olive oil, and five pounds of litharge, then add about twenty ounces of distilled vinegar (two ounces saturating one drachm of

carbonate of potash), these are to be boiled until all moisture is evaporated, and there remains only a few streaks of litharge on the surface; remove now the pan from the fire, and gradually add six or eight ounces of vinegar, constantly stirring the mixture. This is to be again boiled, so as to remove the moisture. Thus in about thirty or forty minutes from the commencement, a perfectly consistent and very white plaster is made.

The same result is obtained by allowing the litharge to digest with the whole of the vinegar for some time, and then adding these to the olive oil, previously heated, and boiling the whole together.—*Journal de Pharmacie.*

ON FERMENTS.

BY M. ROUSSEAU.

First, An essential condition, for a ferment to be capable of developing the alcoholic fermentation is, that it should produce an acid reaction on test paper. This acidity should, moreover, be produced by certain vegetable acids, which are characterized by the property of being transformed into carbonates or into carbonic acid, by their spontaneous decomposition. It is especially remarkable, with reference to these acids, that they are such as pre-exist in all fermentable fruits, and are converted into carbonates when taken into the animal economy; such, for instance, are the tartaric, citric, malic, and lactic acids, &c.

Second, When the acidity of a ferment is very considerable, the vegetable and mineral poisons, the essential oils, &c., do not undergo any modification during the process of fermentation, while the contrary is the case if the ferment has been washed until nearly neutral. On the other hand, fermentation is rendered much more active by the presence of a tartrate, a citrate, a malate, or a lactate. Messrs. Colin and Thenard have long ago pointed out the favourable influence of cream of tartar on fermentation.

Third, When the ferment, instead of being acid, becomes, by a spontaneous alteration, capable of producing an alkaline reaction on test paper, if put in contact with cane sugar, it will no longer develope alcohol and carbonic acid, but sugar of milk, and subsequently lactic acid. It is thus that caseum, diastase, and animal membrane, produce lactic acid when mixed with a solution of sugar, as has been stated by Messrs. Boutron and Fremy. If we examine with care all the conditions by the aid of which the phenomenon is brought about, and the nature of the bodies which are produced, this action will be easily accounted for; for when the yeast becomes alkaline, it is transformed into a substance possessing all the properties of caseine.—*Comptes Rendus.*

FALSE CHEMICAL PREPARATIONS.

In the rage for the invention of new chemical preparations for medicinal use on the other side of the channel, many a "mare's nest" has been found, and combinations have been professedly discovered, which subsequently turned out to have no real existence. We noticed that this was the case with the so called hydro-ferrocyanate of quina, at p. 664, of our last volume. M. Mialhe has also proved that the hydro-sulphate of soda is nothing more than carbonate of that base with a little sulphuret of sodium and some other impurities, as proved by treating it with acetate or nitrate of lead, and that the pseudo-codeine which had got into use, is actually arseniate of potassa.—*Lancet.*

PURIFICATION OF MERCURY.

The mercury should be heated to about 104° Fahr., then shaken with a concentrated solution of nitrate of mercury, by which the foreign metals are oxidized and dissolved. — *Jahrb. der Prakt. Pharm. and Chemical Gazette.* [This method, with the exception of the application of heat, is mentioned by Faraday in his *Chemical Manipulation.*—Ed.]

ON COLLECTING AND PRESERVING ROOTS FOR MEDICINAL PURPOSES.

In a communication recently made by Dr. Houlton to the Royal Medico-Botanical Society on the above subject, he states, that all roots should be taken up at the time that their leaves die, as they then abound with the proper secretions of the plant. This rule has no exception ; it applies to the roots of trees, shrubs, herbs, rootstocks, bulbs, cormi, and tubers, and it includes that curious plant, colchicum, whose flowers only appear in the autumn, and its leaves and fruit the following spring and summer. Biennial roots must be taken up in the first year of their duration ; as, when the leaves decay in the second year, their roots are either decayed, or merely dry woody fibre. Roots intended to be preserved should be dried as soon as possible after they have been dug up ; the large tree roots, especially the more juicy, dry better in their entire state than when sliced.

ACTION OF WEAK ACIDS ON COPPER VESSELS PLATED BY THE ELECTROTYPE PROCESS.

Mr. Warrington, of Apothecaries' Hall, in a recent number of the *Chemical Gazette*, directs attention to the fact, which has come under his notice, that copper vessels, such as saucepans, extract pans, &c., silvered by the electrotype process, are acted upon by weak acids, as lemon-juice or vinegar, if allowed to remain in them for a short time. This, he says, must arise from the deposited silver being so porous as to allow the acids to permeate its substance, and the action is most likely assisted by the formation of a galvanic circuit.

THE GERMAN JOURNALS OF PHARMACY.

In a recent number of Buchner's *Repertorium für die Pharmacie*, is a critical notice of the "General Pharmaceutical Journal" [*Allgemeine Pharmaceutische Zeitschrift*], a new pharmaceutical periodical, which has just appeared in Germany, and which is edited by Dr. Willibald Artus, Professor in the University of Jena.

The *Repertorium* takes this opportunity of mentioning all the periodicals of Germany devoted to this subject, to show that the rival editor, in endeavouring to promote the diffusion of the recent discoveries in Pharmacy, is giving himself unnecessary trouble, as the existing journals are

perfectly adequate to the undertaking, and are now often obliged to encroach upon each other. In passing the literature of pharmacy in review, the Repertorium of Pharmacy [*Repertorium für die Pharmacie*] is stated to be the oldest journal (of twenty-eight years standing), and, in the opinion of its editor, the best. Being entirely devoted to Pharmacology, it gives but short notices of subjects relating to the collateral sciences. All the longer articles are directly or indirectly of pharmaceutical interest, and if in rare instances an exception to this rule be made, it is only in favour of the most meritorious contributors to the journal, who are themselves pharmaceutical men. Three or four volumes appear annually, at the moderate price of 3*fl.* 4*kr.*=3*s.* 6*d.* the volume.

2. The Berlin Annual of Pharmacy [*Das Berlinische Jahrbuch für die Pharmacie*] and collateral sciences, edited now some years by Lindes, appears annually in two volumes, and is exclusively devoted to Pharmacy. It was commenced in 1796, and would in age take the priority of the Repertorium, had it not met with an interruption of several years.

3. The Archives of Pharmacy [*Das Archiv der Pharmacie*] by Rudolph Brandes, and since his death by Bley and Wackenroder, has been published (with an interruption of three years) twenty-one years successively. It appears in monthly numbers, which form four volumes, and costs about 10*fl.* 30*k.*=18*s.* It is exclusively devoted to Pharmacy, and gives the transactions of the Pharmaceutical Society of Northern Germany.

4. The Annals of Chemistry and Pharmacy [*Die Annalen der Chemie und Pharmacie*], published since 1832, at Heidelberg, are a continuation of Hänle (sen.), and subsequently of Geiger's Magazine of Pharmacy, which was published at Karlsruhe. The present editors (Wöhler and Liebig) have given the journal a scientific character, so that its pharmaceutical interest is diminished ; but to the scientific Chemist it is invaluable. It appears in monthly numbers. The price is 12*fl.* 15*k.*=£1 1*s.*

5. The Annual of Practical Pharmacy [*Das Jahrbuch für practische Pharmacie*] by Herberger and Winkler. It was published 1838 and 1839, at Kaiserslantern, since that time at Landau, in eight numbers annually. It was intended for the Rhenish provinces, but is of general interest in its scientific contents. Price 5*fl.* 24*k.*=9*s.*

6. The Pharmaceutical Central Sheet [*Das Pharmaceutische Central Blatt*], published by Leop. Voss, edited by Weinlig. A sheet appears weekly, or fifty six numbers annually, constituting two vols., at 6*fl.* 18*k.*= 10*s.* 9*d.* It had originally the same object in view as the journals already mentioned, but has latterly given purely chemical articles of little interest in practical Pharmacy, and is chiefly filled with extracts from other journals.

7. Notices from the Department of Practical Pharmacy [*Die Notizen aus dem Gebiete der practischen Pharmacie*] and its collateral branches, by Voget: they appear in numbers at Crefeld, twelve numbers form one volume, at 2*fl.* 21*k.*=4*s.* The object is the same as that of the former journals.

These are the pharmaceutical journals appearing in Germany, to be had of all booksellers. Beside these, several societies print their transactions and correspondence for distribution amongst their members, and produce frequently articles of practical or general pharmaceutical interest ; they are, therefore, entitled to be classed among the pharmaceutical publications, although the circulation is limited. Amongst these we may reckon :

8. The Sheet of Intelligence of the Pharmaceutical Association of Bavaria [*Das Intelligenzblatt des Pharmaceutischen Vereins in Bayern*] one number has been printed annually since 1817, at Munich.

9. The Sheet of Correspondence of the Society of Apothecaries in the kingdom of Würtemberg, [*Das Correspondenzblatt des Apotheker-Vereins im Königreiche Würtemberg*] since 1833 several numbers have appeared annually.

10. The Sheet of Pharmaceutical Correspondence for the South of Germany [*Das Pharmaceutische Correspondensblatt für Süddeutschland*] edited by Th. Martius, of Erlangen, has been published by Enke, in sheets since 1840, and may be had of the booksellers.

11. A Sheet of Correspondence of the Associated Apothecaries in the Archdukedom of Baden [*Ein Correspondenzblait des Apotheker-Vereins im Grossherzogthum Baden*] has been published since 1841 for distribution amongst the members of this Society.

In enumerating the pharmaceutical journals printed in German which are in limited circulation among the Apothecaries of Germany, we must not omit:

12. The Northern Central Sheet of Pharmacy and its collateral Sciences [*Das Nordische Centralblatt für die Pharmacie und ihre Hilfswissenchaften*] which is an imitation of the Leipzic Central Sheet, and has appeared since 1839 in sheets, but only of thirty numbers annually, at St. Petersburg. This journal is distinguished by many original communications of great interest from Russia, and is very practical.

13. The Repertorium of Pharmacy and Practical Chemistry in Russia [*Das Repertorium für die Pharmacie und practische Chemie in Russland*] by Gauger, is an imitation of Dr. Büchner's Repertorium. It contains original contributions of practical pharmaceutical interest, notices and extracts from other journals, scientific communications, also a literary review and advertisements.

To those who are interested in the sciences generally, we may mention journals which occasionally contain articles referring to Pharmacy in the strict sense.

14. The Journal of Practical Chemistry [*Das Journal für Practische Chemie*] by Erdman and Marchand, published in Leipzic, in brochures twice a month. It has very interesting articles.

15. The Annals of Physics and Chemistry [*Die Annalen der Physik und Chemie*] by Poggendorff, are of a very high character, on account of their sterling contents, and the very careful manner in which they are edited. They are an uninterrupted continuation of the Journal of Physics, commenced in 1790, by Professor Gren of Halle. After his death they were continued by Professor Gilbert, under the title of "Annals of Physics," and subsequently by Professor Poggendorff. They appear in monthly numbers, and are of fifty-three years' standing. This journal is devoted to scientific Chemistry.

16. The Annual Report of the Progress of Physical Sciences by Berzelius [*Der Jahresbericht über die Fortschritte der physischen Wissenschaften*], three numbers of which appear annually at Tübingen, in German, by Wöhler, is of great interest to the pharmaceutical world.

17. The Journal of Practical Medical Chemistry [*Das Journal für practische medicinische Chemie*] by Dr. Fr. Simon, has appeared since January, 1843, at Berlin, deserves a place in this enumeration, as medical chemistry, embraces physiological, pathological, and pharmacological Chemistry. The editor was formerly an Apothecary.

18. The Flora or General Botanical Journal [*Die Flora oder allgemeine botanische Zeitung*] by Hoppe and Fürnrohr of Ratisbon. The twenty-sixth annual series is now commenced. A sheet appears weekly. This journal must be reckoned amongst the periodicals of interest to the Apothecary, because the vegetable kingdom furnishes the greater number of valuable therapeutic agents, and the subject of Botany is peremptorily necessary to the Apothecary, who wishes to lay a claim to a thorough knowledge of Pharmacy. Both the editors were originally Apothecaries.

19. Lastly, we mention the Botanical Journal [*Botanische Zeitung*] by Hugo Mohl, and *v.* Schlechtendal commenced this year.

ROYAL INSTITUTION.

ELECTRICITY OF STEAM.

The last Friday Evening Meeting for the season, was held at this institution on the 9th of June, when Professor Faraday communicated the result of his recent investigations connected with the electricity of steam. He stated, that the attention of philosophers was first directed to this subject in consequence of a mechanic, engaged in attending on a high-pressure steam-engine, having observed a spark to pass from the boiler to his hand while doing something to the valve. The man, with much alarm, reported that the boiler was full of fire; it was found, however, to be highly charged with electricity. Since that time, during the last two years, several papers had been published on the subject, and a variety of phenomena connected with it described, by Mr. Armstrong, of Newcastle, in the *Philosophical Magazine*. It had been thought probable that it would afford some explanation of the origin of thunder-storms, the electricity being supposed to be produced, in both cases, by the evaporation of water. In confirmation of this view, the fact, which had long been observed, was adduced, that electricity was produced on the sudden evolution of steam caused by dropping water into a crucible heated nearly to redness. Mr. Faraday showed, however, that this effect resulted only under peculiar circumstances, and he said the experiments he was about to perform, entirely overthrew the supposed connexion between the electricity of steam and that of the atmosphere. His experiments were made with a small high-pressure steam-engine, isolated from the ground by blocks of shellac. From this boiler the steam issued through a pipe, at the end of which was a spherical enlargement or globe, and beyond this a wooden tube with a small perforation. The pipe was furnished with a stop-cock between the globe and the boiler; and water was put into the globe up to the level of the pipe and wooden exit-tube. On turning the stop-cock, the steam, passing over the surface of the water contained in the globe, escaped through the wooden tube, and the development of electricity was immediately manifested by a gold-leaf electroscope, connected with the boiler by means of a wire. The boiler was now found to be sufficiently charged with electricity to ignite hydrogen gas or gunpowder; and Mr. Faraday said, that Mr. Armstrong, in experimenting with a large and powerful boiler at a very high pressure, had obtained sparks through a space of twelve inches, the intensity being much greater than they could produce with the most powerful electrical machine belonging to that institution. The wooden exit-tube being now removed, and the steam allowed to escape immediately from the globe, through a large opening, no indication of electricity was afforded by the electroscope, although, in other respects, the arrangements remained

the same as before; thus affording evidence that the phenomenon did not arise merely from the evaporation of water. The question then arose—Did it depend on the friction of the steam against the exit-tube? This question was answered by the facts, that if the water were removed from the globe, and the whole course of the pipe allowed to become so hot that no water was deposited from condensation, the steam might be allowed to escape through the wooden exit-tube as before, without any electricity being manifested. It thus became evident, that neither the evaporation of water, nor the friction of steam, was the cause of the phenomenon in question; but that it arose from the friction of water, carried with force through the wooden tube during the exit of the steam. It further appeared, that the water, to produce the effect, must be in a state of purity; its contamination with a very small quantity of a salt, such as sulphate of soda, or chloride of sodium, entirely prevented the production of electricity. This was shown by dissolving a small fragment of sulphate of soda in the water contained in the globe, when the electroscope ceased to be affected; and even common river water contained sufficient impurity to cause the same result.

Several experiments were performed to show the kind of electricity produced under different circumstances. In operating as above described, the boiler was found to be charged with negative electricity; on introducing a few drops of oil of turpentine into the globe containing the water, positive electricity was obtained. In like manner the steam, after issuing from the exit-tube, was found to be charged with electricity, and this was either positive, negative, or neutral, according to the distance from the extremity of the tube.

REVIEW.

A Treatise on Food and Diet, *with Observations on the* Dietetical Regimen, *suited for disordered States of the Digestive Organs; and an Account of the Dietaries of some of the principal Metropolitan and other Establishments for Paupers, Lunatics, Criminals, Children, the Sick, &c.* By Jonathan Pereira, M.D., F.R.S., and L.S., &c., &c. 8vo., pp. 541. *London: Longman, Brown, Green, and Longmans, Paternoster Row.*

It will be recollected by our readers that Dr. Pereira delivered a lecture last August, on the above subject, at Bloomsbury Square. (See vol. ii, Nos. 3 and 4.) This lecture formed the nucleus of the volume before us, which is the most complete and scientific treatise on diet which we have seen. As we propose, in our next number, to give a more detailed review of the work than our space will admit of this month, we need only observe, at present, that we have no doubt of its fully sustaining the high reputation which the author has acquired by his former works.

TO CORRESPONDENTS.

J. D. T.—We know of no published formula for "Linimentum Potassii Hydriodatis," excepting that in No. 8, Vol. I. of this journal, p. 416.

"A Country Member" complains of the practice, among some Physicians and Surgeons, of prescribing preparations for which there are no authorized formulæ, and enquires what should be used when the following are ordered in prescriptions:—Linimentum Potassii Iodidi—Tinctura Quinæ Composita—Pilula Potassii Iodidi—Acidum Nitro-Muriaticum dilutum. [We regret that we are unable to assist our correspondent.]

"An Associate" (Portsea).—Various methods are adopted in the preparation of concentrated infusions. They are sometimes made by percolation.

J. H. C.—The Excise Laws being rather intricate, we cannot undertake to say how far they apply to the sale of "ammoniacal washing liquor."

"A Friend to the London Pharmacopœia" will justify his designation by using the article ordered (Creta preparata) in making Confectio aromatica. Precipitated chalk is often used, and is a more pure article.

J. W. Elliott is anxious to be informed, through this journal, of a better method than has yet been published for making Concentrated Decoction of Sarsaparilla, and the concentrated infusions and decoctions in general.

"Stultus."—Shellac may be used as a cement, either by simply melting it by the application of heat, or by dissolving it in spirit. When nitric ether is asked for, the spirit is no doubt *generally* intended, but the two preparations differ as much as sulphuric ether and the spirit of sulphuric ether.

W. G., A. P. S. enquires, What proportions of mercury and gold should be used in making the amalgam for stopping teeth? [We have had no experience in stopping teeth.]—All Associates are privileged to attend the Scientific Meetings of the Society, such as that held on the 14th of June.

"An Associate" (Portsea).—Mr. Rowland informs us that he has frequently used the cement composed of Shellac and India-rubber with success, but he finds it necessary to evaporate the mixture in a spoon over a flame, burning away most of the spirit, and to warm the edges of the article to be joined. There are so many different kinds of Naphtha sold, that some difficulty may possibly arise from the operator not having used the right.

"An Associate" wishes to know how to "detect the presence of water in *combination* with milk." [Water is one of the constituents of milk, without which it would cease to be milk; we presume, therefore, that our correspondent alludes to the *supplementary* water generally met with in London milk. It is difficult positively to determine the presence of this, as genuine milk differs greatly in its richness and quality, according to the constitution and state of mind of the animal, and the nature and quantity of its food. Lactometers (graduated tubes) are sold for measuring the per centage of cream. The specific gravity forms a criterion of the quantity of caseine.]

George Knott.—The "colour between pink and purple," used in show bottles, is made by mixing an ammoniacal solution of oxide of cobalt (pink), and an ammoniacal solution of copper (blue), regulating the proportions according to the tint required.

Omega, A. P. S.—We recommend Sturgeon's "Lectures on Electricity," 5*s*., and Bertholet "On Dying."

W. J. T.—Mr. Palmer is one of the best authorities on the subject. A formula for Hyposulphite of Soda will be found in this journal, Vol. II, page 162.

John Stantial, M. P. S., enquires for a recipe for Drifficld's Oils, for horses. [Perhaps some of our readers may be able to furnish it.]

"An Apprentice" enquires if there is any book to which he can refer for information on the proper manner of compounding medicine. [The best information that has been published on this subject in our languagc, is contained in Phillip's Translation of the Pharmacopœia and in the Dispensatories.]

M. A. S.—Graham's "Elements of Chemistry," 26*s*., or Kane's, 24*s*.

D. D., A. P. S.—We recommend Lindley's "Elements and Natural System." D. D. advocates the establishment of a weekly Botanical Journal at a shilling, for the benefit of Associates. We fear that our correspondent has formed too favourable an estimate of the enthusiasm of the Associates on this particular subject. Lindley's *Botanical Register*, and the *Gardners' Chronicle*, are already established works.

M. P. S. asks, Which is the best work on Toxicology? [Christison on Poisons.]

"Amicus."—We cannot account for the formation of the crystals alluded to in the distillation of linimentum camphoræ compositum without knowing what they are, which could only be ascertained by examination. *Query?* Has our correspondent used liquor ammoniæ sesquicarbonatis, instead of liquor ammoniæ?

R. T. S. J. M.—Next month.

A. B. Y. Z.—We recommend "Blaine's Veterinary Art."

A. B., who has lately joined the Society, inquires whether he may have the first six numbers of the Journal at a reduced rate. [A. B. may have them *gratis*, by paying his subscription for the year 1841.]

"A Country Associate" wishes us to insert the questions proposed at the examinations at Bloomsbury Square. [We are not authorized to comply with this request, such matters being regulated by the Council.]

X. L.—Among our numerous communications, we fear the letter has been mislaid. Will X. L. favour us by repeating the question?

D. S. is advised to forward his subscription to the Secretary.

"Juvenis" (Chester), wishes to know when the Medical Reform Bill will be passed? that he may determine how long his subscription will be necessary! [A difficult question, and a remarkable *non sequitur!*]

Juvenis also enquires, How Pil. Galban. Co. can be kept soft? [By making it in small quantities, and frequently. (See also Vol. II. p. 8).

W. S.—W. J. L.—P. K. See Vol. II. pp. 57 to 62, 117 and 118.

"Socius" (Chester).—We are at all times happy to answer to the best of our ability, any enquiries respecting the Pharmaceutical Society, which are made by parties *desiring information.*

"Orego."—1. Dr. Pereira's Materia Medica. 2. The young man cannot be admitted without an examination at Bloomsbury Square. 3. See Vol. ii, pages 57—62, 117, 118.

"Inquisitor."—The term Hierapikra is derived from Ἱερος, holy, and Πικρος, bitter.—Pill Cochia. The Greek word Κοχυω indicates "To flow abundantly," from which, probably, the word *Cochia* is derived.

V. B. is altogether mistaken.

A. Z. asks our opinion of a work (in 2 vols. price 7*s.*) which is advertised to teach the Latin language without burdening the memory with the rules of syntactical grammar; which is said to supersede the use of a Dictionary and supply the place of a classical tutor. [We have not seen the work and should be sorry to speculate.]

"Jus." should state the cases to the Council in a tangible form.

N.B.—An article is in type on the Medicine Stamp and Licence Acts, but the Editor finding that the subject requires further investigation, has thought it better to postpone its insertion for another month. Several other articles, as well as Answers to Correspondents, are unavoidably deferred.

Advertisements to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. II.—AUGUST 1st, 1843.

THE SALE OF SPIRITS OF WINE.

SEVERAL correspondents have written to us on this subject, and a few cases have recently been reported in which fines have been inflicted to the amount of £10 or £12. We have also been called upon to explain the meaning of the Acts of which we gave extracts in Vol. ii., No. 10; for this purpose we have thought it right to reduce the said extracts to plain English, by omitting the legal technicalities and repetitions, in which amended state we subjoin them.

9TH GEO. II., CAP. 23.—No person shall presume to sell or retail any brandy or any other distilled spirituous liquors or strong waters, unmixed or mixed with themselves, or any other ingredients, and by whatsoever name or names they are or may be called, publicly or privately, in any less quantity than two gallons, without first taking out a licence for that purpose, as is hereinafter directed, within ten days at least before he shall sell or retail the same, for which he shall pay down for the same the sum of £50 (Sec. 1). * * * Every person who shall take out such licence is required to renew such licence from year to year; and if any person or persons shall presume to offer to sell or retail any of the said spirituous liquors, in any less quantity than aforesaid, without taking out such licence and renewing the same yearly, he shall forfeit the sum of £100 for each offence (Sec. 2). * * * No licence shall be granted to any person or persons whatsoever, for selling by retail any spirituous liquors or strong waters whatsoever, except to such persons only who shall keep public victualling houses, inns, coffee-houses, ale-houses, or brandy-shops, and use or exercise no trade whatsoever (Sec. 10). * * * * This Act shall not extend to any Physicians, Apothecaries, Surgeons, or Chemists, as to any spirits or other spirituous liquors which they may use in the preparation or making up of medicines for sick, lame, or distempered persons only (Sec. 12).

16th GEORGE II., CAP. 8.—This Act shall not extend to any Physicians, Apothecaries, Surgeons, or Chemists, as to any spirits or spirituous liquors, which they may use in the preparation or making up of medicines for sick, lame, or distempered persons only; and no person shall be deemed or taken to be a retailer of spirituous liquors who doth not retail the same to be drank or consumed in his warehouses, shops, &c. * * * * or that shall otherwise retail or send the same abroad in less quantities than one pint (Sec. 12.)

We have not heard of any case in which a Chemist has been fined for selling spirits of wine *for medicinal use;* in all the cases, the particulars of which have been reported to us, the parties have known or had reason to suspect that the spirit was required for other purposes, and the quantity sold has, in most instances, been a pint and a half. In our opinion, every penalty

which has been inflicted for the sale of spirit *in less quantity than a pint*, to be consumed or used *off the premises*, has been a violation of the Act.

THE MEDICINE STAMP AND LICENCE ACTS.

The first of these Acts was passed in 1783 (the 23d Geo. III.) It is entitled "An Act for granting to His Majesty a Stamp Duty *on Licences to be taken out* by *certain* Persons *uttering or vending Medicines:* and certain Stamp *Duties on all Medicines* sold under such Licences, or under the authority of His Majesty's Letters Patent."

Another Act (the 25th Geo. III.) was passed in 1785. The objects of these Acts were, first, To impose the necessity of a licence on all persons vending drugs and medicines who were not qualified by service of an apprenticeship to the business of a chemist, druggist, apothecary, or surgeon—with a certain exception relating to naval and military surgeons; secondly, To impose a duty on such licences, and on all medicines sold by licensed persons; thirdly, To subject to a duty, compounds prepared and sold *under the authority of letters patent* (called Proprietary Medicines), which was afterwards extended to persons (whether licensed or otherwise qualified to sell medicines) claiming or professing some secret or mysterious art, other than that of medical skill and knowledge, in preparing medicaments as specifics for preventing or healing human ailments and maladies; and held out as such to the world by public announcement—what, in short, are called by the name of Nostrums, and made and sold by persons styled Quacks. The above Acts have been repealed, and followed by others of a similar nature, namely 42d Geo. III., 43d Geo. III., 44th Geo. III., and 52d Geo. III.

It is not easy to give in a concise form the substance of these Acts, which are now in force, and which have never been understood by the parties to whom they refer. The difficulty of reducing this subject to an intelligible shape is pointed out by Mr. Price, who was engaged on behalf of the trade, in the year 1829, in resisting the persecutions of the Commissioners of Stamps and common informers. Mr. Price observes, "Prior enactments are nullified or neutralized by subsequent provisions, and schedules have been added which cannot consistently be read with or reconciled to the language of the Acts; because it has been attempted to schedule what is incapable of being scheduled. Those schedules were appended for the purpose, it must be presumed, of supplying any supposed deficiencies in the statutes; but there is an enactment in the body of the Acts for extending by construction the operation of those catalogues; and, finally, there are exceptions within exceptions, by which the exemptions

appear at first sight to be resolved into the original enactments, and what was intended to give particular privileges has been nearly so generalized as again to exclude the exclusions."*

The second section of the 42d Geo. III, provides, that

"For and upon every packet, box, bottle, pot, phial, or other inclosure, containing any drugs, herbs, pills, waters, essences, tinctures, powders, or OTHER *preparation or composition* whatsoever, used or applied externally or internally as medicines or medicaments for the prevention, cure, or relief of any disorder or complaint incident to or in anywise affecting the human body, which shall be uttered or vended in Great Britain, there shall be charged a *stamp duty*, according to the rates following (that is to say), where such packet, box, bottle, pot, phial, or other inclosure as aforesaid, with its contents, shall not exceed the price or value of one shilling, there shall be charged a stamp duty of one penny halfpenny; and where above one shilling, and not above two shillings and sixpence, three-pence; above two shillings and sixpence, and not above four shillings, sixpence; above four shillings, and not above ten shillings, one shilling; above ten shillings, and not above twenty shillings, two shillings; above twenty shillings, and not above thirty shillings, three shillings; above thirty shillings, and not above fifty shillings, ten shillings; and above fifty shillings there shall be paid a *stamp duty* of twenty shillings."

By the sixth section it is further enacted, that

"Every *owner*, proprietor, maker, and *compounder* of, and *every person* in Great Britain, uttering, vending or *exposing to sale*, or keeping ready for sale any such drugs herbs, pills, waters, essences, tinctures, powders, or OTHER *preparations or compositions* whatsoever, used or applied or to be used or applied externally or internally as medicines or medicaments, for the prevention, cure, or relief of any disorder or complaint incident to or in anywise affecting the human body, or any packets, boxes, bottles, pots, phials, or other inclosures aforesaid, with any such contents as aforesaid, SUBJECT TO THE DUTIES herein *before* granted, shall annually take out a *licence*; and that for and upon every licence so taken out by any such person who shall reside within the cities of London or Westminster, the borough of Southwark, or within the limits of the twopenny post, or within the city of Edinburgh, there shall be charged a stamp duty of forty shillings; and for and upon every licence so taken out by any other such person who shall reside in any city, borough, or town corporate, or in the towns of Manchester, Birmingham, or Sheffield, there shall be charged a stamp duty of ten shillings; and for and upon every licence so taken out by any other such person residing in any other part of Great Britain, there shall be charged a stamp duty of five shillings."

The penalty for selling such articles without possessing a licence is £20. The fourth and fifth sections refer to certain exemptions similar to those contained in the 52d Geo. III., which is entitled "*An Act to amend*" the former Acts, &c. &c. This Act repeals the schedule of the 44th Geo. III., substituting another which contains a long list of patent and proprietary medicines liable to duty; an enumeration which is rendered almost unnecessary by the following paragraph:

"And also all *other* pills, powders, *lozenges*, tinctures, potions, cordials,

* "Abstract of the Medicine Stamp and Licence Acts, with Observations on their Legal Effect and Operation," &c. By George Price, Esq., of the Middle Temple, Barrister-at-law. 1830.

electuaries, plaisters, unguents, salves, ointments, drops, lotions, oils, spirits, medicated herbs and waters, chemical and *officinal* preparations whatsoever, to be used or applied externally or internally as medicines or medicaments, for the prevention, cure, or relief of any disorder or complaint incident to, or in anywise affecting the human body, made, prepared, uttered, vended, or exposed to sale, by any person or persons whatsoever, wherein the person making, preparing, uttering, vending, or exposing to sale the same, hath, or claims *to have, any occult secret or art for the* making or preparing the same, or hath or claims to have, any exclusive right or title to the making or preparing the same, or which have at any time heretofore been, now are, or shall hereafter be prepared, uttered, vended, or exposed to sale, under the authority of any *letters patent* under the great seal, or which have at any time heretofore been, now are, or shall hereafter be, by any public notice or advertisement, or by any written or printed papers or hand-bills, or by any label or words written or printed, affixed to or delivered with any packet, box, bottle, phial, or other inclosure containing the same, held out or recommended to the public by the makers, venders, or proprietors thereof, as nostrums or proprietary medicines, or as specifics, or as beneficial to the prevention, cure, or relief of any distemper, malady, ailment, disorder, or complaint incident to or in anywise affecting the human body."

The 52d Geo. III., which confirms the provisions above quoted from the former Acts, enacts also, that the stamps provided and supplied by the Commissioners of Stamps, denoting the duty charged on each packet, box, bottle, pot, phial, or other enclosure, shall be

"Properly and sufficiently pasted, stuck, fastened, or affixed thereto, so and in such manner as that such packet, box, bottle, pot, phial, or other inclosure cannot be opened, and the contents poured out or taken therefrom, without tearing such stamped cover, wrapper, or label, so as to prevent its being made use of again."

The penalty for non-compliance with this order is ten pounds. The following are the SPECIAL EXEMPTIONS:

"It is provided by the fourth section, that it shall not be necessary for any victualler, confectioner, pastrycook, fruiterer, or other shopkeeper in Great Britain, who shall only sell any of the artificial or other waters *mentioned in the schedule hereunto annexed*, to be drunk in his or her house or shop, and which shall be actually drank therein, *to take out a licence for that purpose under the provisions of the said Acts of the* 42*d and* 44*th* years of his Majesty's reign, *provided such waters shall be sold by him or her in bottles, with paper covers, wrappers, or labels, duly stamped*, properly and sufficiently pasted, stuck, fastened, or affixed to the same in the manner hereinbefore mentioned; any thing in the said Acts contained to the contrary notwithstanding.

"All drugs named or contained in the book of rates subscribed with the name of Sir Harbottle Grimstone, Baronet, and mentioned and referred to by the Act of Tonnage and Poundage made in the twelfth year of the reign of King Charles the Second, and in another book of rates, intituled 'An additional Book of Rates of Goods and Merchandise usually imported and not particularly rated in the Book of Rates, referred to in the Act of Tonnage and Poundage made in the Twelfth Year of the Reign of King Charles the Second, with Rules, Orders, and Regulations, signed by the Right Honourable Spencer Compton, Speaker of the Honourable House of Commons, and mentioned and referred to by an Act made in the Eleventh Year of the Reign of His Majesty King George the First.'

"All medicinal drugs whatsoever which shall be uttered or vended entire, without any mixture or composition with any other drug or ingredient whatsoever, by any surgeon, apothecary, chemist, or druggist, who hath served a regular apprenticeship, or by any person who hath served as a surgeon in the navy or army under any commission or appointment duly entered at the War Office or Navy Office, *or by any other person whatsoever licensed* to sell any of the medicines chargeable with a stamp duty.

"And *also all mixtures*, compositions or preparations *whatsoever*, mixed or compounded with, or prepared from medicinal drugs, medicated or chemical preparations or compositions, or other ingredients, bearing different denominations, or having different properties, qualities, virtues, or efficacies, which shall be uttered or vended by any *such surgeon, apothecary, chemist, or druggist* as aforesaid, *or by* any such person who hath served as a *surgeon in the navy or army*, under any such commission or appointment as aforesaid, *the different* denominations, properties, qualities, virtues, and efficacies of which mixtures, compositions, and preparations as aforesaid, *are known*, admitted, and approved of, in the prevention, cure, or relief of any disorder, malady, ailment, or complaint incident to, or in anywise affecting the human body [and wherein the person mixing, compounding, preparing, uttering, or vending the same hath not, nor claims to have any *occult* secret or art for the mixing, compounding, or preparing the same], [nor hath, nor claims to have, any *exclusive right or title* to the mixing, compounding, or preparing, or to the vending of the same; and which mixtures, compositions, or preparations have not been, are not, nor shall hereafter be prepared, uttered, vended, or exposed to sale under the authority of any letters patent under the great seal], [nor at any time heretofore have been, now are, or shall hereafter be, by any public notice, advertisement, or by any written or printed papers or hand-bills, or by any labels or words written or printed and affixed to *or delivered with* any such packet, box, bottle, pot, phial, or other inclosure aforesaid, held out or recommended to the public by the owners, proprietors, makers, compounders, original or first venders thereof, as *nostrums or proprietary medicines, or as specifics, or as beneficial, for the prevention, cure, or relief of any such distemper, malady, ailment, or complaint as aforesaid.*"

Mr. Price, in the pamphlet already quoted, has given the following explanation, which, with the extracts above given, will place our readers in possession of the most important features in the Acts, although we have not attempted to go into every detail.

There are, on the whole review of these Acts considered together, and with reference to their objects, and to each other, *four classes* of *persons* contemplated by the legislature, and *three sorts* of things as within the scope of the medicine duty laws.

The classes of persons are :—

First, Those who by apprenticeship to surgeons, apothecaries, chemists and druggists (and surgeons of the navy and army), derive the qualification of skill from discipline, for engaging and practising in the sale of drugs and medical preparations.

Secondly, Persons procuring the legal or statutory qualification of a licence.

Thirdly, Patentees of proprietary preparations in medicine, quacks, or nostrum-makers ; and,

Lastly, All unlicensed* venders of drugs and medical compounds†,

The three things contemplated are:

First, Drugs, &c. entire.

Secondly, Preparations and compounds of those of legitimate character; and,

Thirdly, Such of the latter as are of spurious or empirical character.

Of the four classes of *persons* contemplated by the Acts, the first class are exempted from all the restraining and disabling provisions, whether by clause or schedule, except that of the impost of *duties* on the third sort of things, which are the subject-matter of the statutes, if *sold* by them.

The second class of *persons* contemplated, are rendered capable of vending the *first* class of things without payment of other duty, than that imposed on the necessary licence; and are authorized to sell the second sort of things on payment *by them beforehand*, of the duties imposed on *their* sale by the law; and also to sell the third sort of things received from the owners or compounders, when stamped, as having paid the duty.

The third class of persons consists of all *original venders*, makers, or proprietors of patent medicines (as they are termed), and empirical nostrums, whether patent or not; in other words, proprietors, makers, and *first venders* of the third sort of things above enumerated.

Thus the statutes on this subject have made a clear distinction between persons qualified by education and persons authorized by licence to sell medicines. Those sold by the former are not subjected to duty—those sold by the latter are: hence the medicines sold by a surgeon, apothecary, chemist, or druggist, are not chargeable with duties, which, when sold by a licensed vender of medicines, would be so chargeable. This was the great and main object of all the medicine stamp acts, and is the law made by those statutes.

They have also created a similar distinction between medicines made and sold as nostrums and such as are not. Such preparations as are so made and sold are subjected to duty, whilst the same compounds sold in the regular course of trade are not. The same preparation may be a nostrum in the hands of one person, which may not be such in those of another. Thus lozenges or pills, &c. made and sold in an open manner, after the common course of trade, may not be liable to duty; but when made as matter of mystery, and sold originally, or at first, with a catalogue of virtues ascribed to it in particular complaints, it becomes so liable, and must bear a stamp.

* "Unlicensed persons" must not be deemed to include persons unlicensed on the ground of the higher qualification.

† Confectioners, &c., are merely an exception.

It would appear from this statement, which we believe to be perfectly correct, that grocers, oilmen, hucksters, and other unqualified persons, cannot legally sell medicines either simple or compounded without taking out a licence, and cannot sell *compounded* medicines, such as tinctures, pills, &c. without attaching a stamp to each article.

THE SALE OF ALUM TO BAKERS.

On examining the Acts of Parliament, it appears that Chemists and Druggists are not liable to a fine for selling alum to Bakers, although Bakers are subject to penalties and imprisonment for using it in the manufacture of bread, or even having it on their premises. The law on this subject is particularly stringent on the Bakers, who are liable to have their premises searched in case of any suspicion arising, and are prohibited, under severe penalties, from offering any resistance to such search. Nevertheless the law is inoperative, as Bakers' bread is seldom if ever free from alum. We have been informed by some of the trade that it is *absolutely necessary* in the quartern and half-quartern loaves, which would otherwise adhere together on being withdrawn from the oven, instead of separating with facility, which is generally the case. In cottage-loaves, and other fancy bread, the Bakers admit that alum is not so necessary, and its use, in these cases, is much less frequent.

Various contrivances are adopted to evade the law. Alum is called by Bakers "*stuff*," or "*the doctor*." It is usually bought by the master, who deposits the proper quantity for each batch in some corner of the premises, where the foreman finds it at the proper time. In some houses the master is subject to a fine in case of his neglecting to provide "the doctor;" which fine is the perquisite of his journeymen. By these and other precautionary regulations, the inconvenience of detection is avoided, and although every person knows that alum is always used, no one is in possession of positive evidence of the fact, and all parties concerned keep their own counsel, being bound by that kind of "honour" which prevails "among thieves." The masters are interested in using "the doctor," because they can by this means improve the appearance of an inferior flour, and the men are equally interested in the matter as the bread is made with less trouble. The parties aggrieved by this practice are those who consume the bread. Dr. Pereira observes,

"Whatever doubts may be entertained as to the ill effects of alum on the healthy stomach, none can exist as to its injurious effects in cases of dyspepsia. Bread which contains alum is objectionable, not merely on account of this salt, but because it is generally made from inferior flour, which, when mixed with yeast and water, and formed into dough, quickly passes through the stage of vinous fermentation, and becomes acid.*"

* *Treatise on Food and Diet.* By Jonathan Pereira, M.D., F.R.S., p. 311.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE III.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
HONORARY MEMBER OF THE PHARMACEUTICAL SOCIETY.

DOUBLE REFRACTIVE AND OTHER ALLIED PROPERTIES OF CRYSTALS.

In my last lecture I explained the nature and cause of double refraction; and I now proceed to examine the double refractive property of crystals, and to show how this is connected with, or related to, other properties of crystalline substances.

1. *Double Refraction of Crystals.*—Every transparent crystalline body refracts the rays of light which are incident on it at oblique angles; and the degree of its refractive power depends on two circumstances; viz., the angle of incidence, and the nature of the crystalline substance. In these respects crystals agree with all other transparent media.

But a very large number of crystals possess the property of double refraction; and they are, therefore, called *doubly refracting crystals*, to distinguish them from others which have not this property, and which are denominated *singly refracting crystals.*

The double refraction of some crystals is immediately manifested by the production of duplicate images; either through two parallel surfaces, as Iceland spar, or through two surfaces which are more or less inclined on each other. Thus to observe the double refraction of a crystal of quartz, it is necessary to look through a pyramidal and lateral plane at the same time. By this contrivance the surface of emersion is inclined to that of admission, which causes the two pencils to emerge at different inclinations, and so become further separated as they proceed.

Many crystals, however, possess the property of double refraction in so feeble a degree that it is impossible to see, under ordinary circumstances, two images; and in such cases we are constrained to employ the polariscope to detect this property.

In every doubly refracting crystal there are one or more positions or directions in which the two images become superposed; or, in other words, in which no double refraction exists or is evident. These directions are called the *optic axes* or *the axes of double refraction.* I have already stated that the phrase *axes*

of NO *double refraction* would be more intelligible. These axes may be regarded as positions of equilibrium where certain forces, which exist within the crystal and act in opposition, balance each other. In crystals of certain forms they coincide with the geometrical or crystallographical axes, whereas in crystals of other shapes they do not; but to these points I shall again have to beg your attention.

If we consider doubly refracting crystals in regard to the number of their optic axes we may divide them into two orders, those possessing only one axis, others having two axes. The first are called *uniaxial*, the second *biaxial* crystals. As this distinction is connected with other remarkable optical peculiarities, as well as with the geometric and thermotic properties of crystals, it will be necessary to notice it a little more in detail.

a. Uniaxial Crystals.—Those crystals which have only one axis of [no] double refraction, and which, in consequence, are termed *uniaxial crystals*, or *crystals with one optic axis*, belong to the square prismatic or rhombohedric systems. In them the geometric or crystallographic axis is coincident with the optical one; that is, the line or direction in the crystal, around which the figure is symmetrically disposed, or about which every thing occurs in a similar manner on all sides, is coincident with the optic axis, or the axis around which the optical phenomena are the same in all directions. You must not, however, suppose that the axis is a single line; for there must be as many axes as there may be lines parallel to each other, so that the word is merely synonymous with a fixed direction.

In all other directions but the one called the optic axis, these crystals doubly refract; and of the two rays thus produced, one follows the ordinary laws of simple refraction, and is accordingly called the *ordinary ray*, while the other, being subject to an extraordinary law, is denominated the *extraordinary ray*.

These two rays advance with unequal degrees of velocity; the one suffering greater retardation than the other. When the *ordinary* ray advances more rapidly than the extraordinary one, the crystal is said to have a *negative* or *repulsive axis of* [*no*] *double refraction;* but when the ordinary ray advances less rapidly, the crystal is said to possess a *positive* or *attractive axis*. In other words, when the extraordinary ray is refracted *towards* the axis, the crystal is said to have a *positive* axis; but when the ray is refracted *from* the axis, the crystal is said to have a *negative* axis. These terms are not very expressive of the property they are intended to represent. Biot used the terms *attractive* and *repulsive* to designate the attractive or repulsive forces which he supposed to emanate from the axes of crystals. For it is obvious that if the extraordinary ray be most retarded

it will be refracted from the axis, that is, it will appear to be repelled by a force emanating from the axis; whereas, if it be the least retarded, it will be refracted towards the axis, or will appear to be attracted by a force emanating from the axis. Now it was to obviate the hypothesis which these terms involve, that Brewster substituted the words *positive* and *negative* for the terms *attractive* and *repulsive*, merely meaning to denote by them the opposition, but not the nature, of the forces.

Table of Uniaxial Crystals.

Negative (—) *or repulsive Crystals* (Extraordinary ray most retarded).	*Positive* (+) *or attractive Crystals.* (Ordinary ray most retarded).
Iceland Spar	Zircon
Tourmaline	Quartz
Nitrate of Soda	Oxide of Tin
Cyanide of Mercury	Ice

In uniaxial crystals the position of the optic axis is constant, whatever be the colour of the light; whereas in biaxial crystals this is not the case, as I shall presently show.

b. Of Biaxial Crystals.—A very large number of crystals, including all which belong to the right rhombic prismatic, oblique prismatic, and doubly oblique systems, have two axes of double refraction, which are more or less inclined to each other. Such crystals are, in consequence, denominated *biaxial crystals*, or *crystals with two optic axes.* In them there is no single line or axis around which the figure is symmetrical, as in uniaxial crystals; and the optic axes do not always, or even frequently, coincide with any fixed line in the crystals. Now this fact has led Dr. Brewster to believe that the optic axes are not the real axes of the crystals, but only the resultants of the real, or *polarising, axes*, or lines, in which the opposite actions of the two real axes compensate each other. Hence he terms them the *resultant axes*, or *axes of no polarization*, or *of compensation.*

The following is a list of a few biaxial crystals; and for a more extensive one I must refer my auditors to Dr. Brewster's works:

Table of Biaxial Crystals.

	Character of Principal Axes.*	*Inclination of Resultant Axes.*
Glauberite	Negative	2° or 3°
Nitrate of Potash	Negative	5° 20′
Carbonate of Lead	Negative	10° 35′
Arragonite	Negative	18° 18′
Borax	Positive	28° 42′
Sugar	Negative	50°
Selenite	Positive	60°
Rochelle Salt	Positive	80°

Of the two rays produced by the double refraction of biaxial

* The *principal axis* is, according to Dr. Brewster, the middle point between the two nearest poles of no polarization.—*Phil. Trans.*, 1818.

crystals, neither can be strictly denominated the *ordinary* one, since neither of them is refracted according to the ordinary law of single refraction. Both of them then are *extraordinary* rays, since they are refracted according to the laws of extraordinary refraction.

Another peculiarity of biaxial crystals is that the position of the axes is not constant, but varies in the same crystal, according to the colour of the intromitted ray, and the temperature of the crystal. Thus a violet ray is separated into two pencils when incident in the same direction in which a red one is refracted singly. Sir John Herschel, to whom we are indebted for this discovery, found that the inclination of the resultant axes, in Rochelle salts, is for violet light 56°, and for red light 76°, but in the case of nitre, the inclination of the axes for violet light is greater than for red light, and Dr. Brewster discovered that glauberite has two axes for red light inclined about 5°, and only one axis for violet light. The changes produced on the inclinations of these axes by heat, I shall hereafter have occasion to notice.

In conclusion, then, crystals considered with respect to their singly or doubly refractive properties may be thus arranged :

OPTICAL CLASSIFICATION OF CRYSTALS.

Class 1.
Singly refracting crystals.

Class 2.
Doubly refracting crystals .. { *Order* 1. Uniaxial.. } either { *a*. Repulsive (negative) or
{ *Order* 2. Biaxial .. } { *b*. Attractive (positive)

2. *Form of Crystals.*—A remarkable connexion exists between the optical properties and the geometrical forms of crystals ; and to this I have now to beg your attention.

A crystal, like every other solid, possesses length, breadth, and thickness ; and the measures of these are three imaginary lines which pass through the centre of the crystal, and are termed the *axes*. They may be denominated *crystallographical* or *geometrical axes*, to distinguish them from the optic axes with which they do not always coincide. Rose defines them to be "certain lines which pass through the centre of the crystal, and around which the faces are symmetrically disposed."

In some forms all these axes are equal in length, as in the cube ; and in such cases it is said, that the *axes are similar* or *alike*. Such crystals are termed *equiaxed*. But in a very large proportion of cases the axes are not all equal, and these crystals are said to be *unequiaxed*. Now it is a remarkable circumstance, that the equiaxed crystals are *single* refractors, while the unequiaxed are *double* refractors. This is the first fact demonstrative of the connexion between the forms and the optical properties of crystals.

Of the unequiaxed crystals some have two, others three kinds of axes. If, for example, the length and the breadth of a crystal be alike, but the thickness different, the axes are of two kinds. Such crystals are usually said to have *two dissimilar axes*, but I shall term them *di-unequiaxed*. Other unequiaxed crystals have all their axes unequal; in other words, their length, their breadth, and their thickness are all unequal. Such crystals are generally said to have *three dissimilar axes*, but I shall call them *tri-unequiaxed*. Now, it is most remarkable that the di-unequiaxed crystals are double refractors, with *one* axis of [no] double refraction, while the tri-unequiaxed are double refractors with *two* axes of [no] double refraction. Here is another curious fact, illustrative of the relation which exists between the shape and optical properties of crystals.

Modern crystallographers arrange crystals in six groups, called *systems*. The equiaxed crystals constitute one system, called the *cubic, octohedral* or *tessular system*. The di-unequiaxed crystals comprehend two systems; one termed the *square prismatic* or *pyramidal system*, the other called the *rhombohedric* or *rhombohedral system*. The tri-unequiaxed crystals include three systems: one denominated the *right rhombic* or *rectangular prismatic system;* a second termed the *oblique rhombic* or *rectangular prismatic system;* and a third, called the *doubly oblique prismatic system*. The following table will, perhaps, render these statements more intelligible:

GEOMETRICAL CLASSIFICATION OF CRYSTALS.

		Systems.
Class 1. Equiaxed crystals (*single refractors*)		1. Cubic or Octohedral.
Class 2. Unequiaxed crystals (*double refractors*)	*Order* 1. Di-unequiaxed (*one axis of* [*no*] *double refraction*)	2. Square Prismatic. 3. Rhombohedric.
	Order 2. Tri-unequiaxed (*two axes of* [*no*] *double refraction*)	4. Right Rhombic Prismatic. 5. Oblique Rhombic Prismatic. 6. Doubly Oblique Prismatic.

I shall not at present enter into any further details respecting the geometrical peculiarities of each of these systems, as the subject will be more appropriately considered presently.

3. *Expansibility.*—Between the particles of matter there exist two classes of forces, the one attractive, the other repulsive. By the first, particles are approximated and united to form masses; by the second, they are separated to greater or less distances. Hence attraction and repulsion are antagonizing forces.

Caloric or heat is a repulsive force. It augments the distance between particles and thereby weakens their attractive force; for molecular attraction rapidly diminishes as the distance between the particles increases. Hence solids and fluids, when heated, expand or dilate.

But the force of attraction which exists between the particles

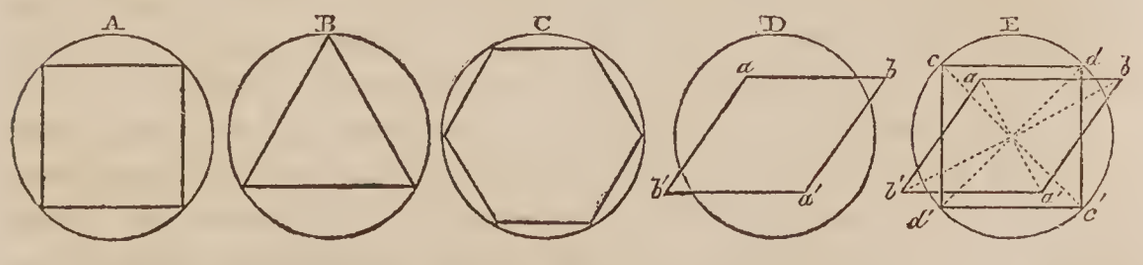
of different bodies (solids and liquids) varies considerably: in some being much greater than in others. Hence, the same amount of heat gives rise to a very different degree of expansion in different bodies. In other words, each solid or liquid has an expansion peculiar to itself, owing to the greater or less attractive force which exists between the molecules.

Some crystals, when heated, expand *equally* in all directions, and such I shall accordingly denominate *equiexpanding*. Now it is obvious that in these the existence of equally attractive forces in all directions must be inferred; and it is a curious and striking confirmation of this inference that crystals, which suffer equal expansion in all directions, are singly refracting and equiaxed.

A very large number of crystals, however, dilate, when heated, *unequally* in different directions; and such may be conveniently denominated *unequiexpanding*. In them expansion in one direction is accompanied in some, if not in all cases, with contraction in another direction; and it is, therefore, obvious, that the force of attraction between their particles must be unequal in different directions, the attractive or cohesive force being least in that direction in which the expansion is the greatest. Crystals of this class are doubly refracting and unequiaxed.

The essential difference in shape between an equiexpanding and an unequiexpanding crystal is, that the first can be inscribed within a sphere, the second cannot. We may rudely illustrate this in the lecture-room, by diagram, substituting planes for solids, by inscribing a square, or an equilateral triangle in a circle (fig. 23, A and B). The first will represent the face of a cube, the second that of the regular tetrahedon. Now, it will be perceived that the circumference of the circle passes through all the angular points of the figure about which it is described. All these forms are equiexpanding.

Fig. 23.



The regular six-sided prism expands unequally in some directions, but equally in others. If now we describe a circle around the terminal faces, it will be perceived that it passes through all the angular points of this face (fig. 23, C), and in all directions, in this plane, the crystal expands equally. The rhombohedron cannot be inscribed within the sphere, because its axes are unequal. If, for example, we attempt to describe a circle around the

rhombic face of Iceland spar (fig. 23, D), it will be found that while the obtuse angles (*a a'*) are contained within the circle, the acute ones (*b b'*) project beyond it. Now, under the influence of heat, this face expands in the direction of the shortest axis, but contracts in that of the longest axis, by which the rhomb approaches to the square, the obtuse angles becoming more acute, the acute ones more obtuse (fig. 23, E).

These illustrations will serve to give some general notions of the relations which exist between the forms and expansibilities of crystals.

The *di-unequiaxed* crystals — that is, the doubly-refracting crystals, which have only one axis of [no] double refraction— expand equally in the direction of the equal crystallographical axes, but differently in that of the remaining one; and we may, therefore, denominate them *di-unequiexpanding crystals.* If, for example, a rhombohedron of Iceland spar be subjected to heat, it expands in the direction of its shortest axis, but contracts in all directions perpendicular to this, and in an intermediate direction it neither dilates nor contracts. Thus, according to Mitscherlich and Dulong, when heated from 32° to 212° Fahr, it actually expands, in the direction of the shorter axis, 0.00286, and contracts in a direction perpendicular to this 0.00056; so that its apparent or relative expansion in this axis is 0.00342 (that is 0.00286 + 0.00056). Now a necessary consequence of this unequal expansion is an alteration in the angles of the crystal: the obtuse ones become more acute, the acute ones more obtuse. In other words, the rhombohedron approximates to the cube; and in proportion to this change of form is the diminution of doubly refracting energy. Mitscherlich had conjectured that the latter effect would take place, and Rudberg has verified the conjecture. The last mentioned philosopher found, that while the ordinary refraction of Iceland spar underwent little or no change, the extraordinary refraction was considerably diminished by an augmentation of temperature.

FIG. 24.

Crystal of Selenite.

The *tri-unequiaxed* crystals expand when heated, unequally in the direction of all their axes, and, therefore, they may be denominated *tri-unequiexpanding crystals.* When the temperature of selenite is augmented, the inclinations of all its faces suffer changes. Thus according to Mitscherlich by heating it from 32° to 212°, the inclination of the faces *cc'* was altered 10′50″, that of the faces *a a'* 8′25″, and that of the edges *b b'* only 7′26″.

I have already explained what is meant by the terms *positive* or *attractive*, and *repulsive* or *negative* axes. They refer to optical differences in crystals, for which we find no corresponding

geometric or crystallographical differences. Now there have been observed, in the effects of heat on crystals, differences analogous to the optical ones just referred to. Thus, in crystals with a repulsive or negative axis, as Iceland spar, expansion is greatest in the direction of the shortest axis, showing that the molecular attraction in this direction is the weakest; whereas in positive or attractive crystals, as selenite, heat produces less dilatation in a direction parallel to the axis than in a direction perpendicular to it.

"The inclination of the optic axes, in biaxial crystals," says Mr. Lloyd, "is a simple function of the elasticities of the vibrating medium in the direction of three rectangular axes, and the plane of the optic axes is that of the greatest and least elasticities. If, then, these three principal elasticities be altered by heat in different proportions, the inclination of the axes will likewise vary; and if, in the course of this change, the difference between the greatest elasticity and the mean, or between the mean and the least, should vanish and afterwards change sign, the two axes will collapse into one, and finally open out in a plane perpendicular to their former plane. All these variations have been actually observed. Professor Mitscherlich found, that in sulphate of lime the angle between the axes (which is about 60° at the ordinary temperature) diminishes on the application of heat; that, as the temperature increases, these axes approach until they unite; and that, on a still further augmentation of heat, they again separate, and open out in a perpendicular plane. The primitive form of the crystal undergoes a corresponding change, the dilatation being greater in one direction than in another at right angles to it. Sir David Brewster has observed an analogous and even yet more remarkable property in glauberite. At the freezing temperature, this crystal has two axes for all the rays of the spectrum, the inclination of the axes being greatest in red light and least in violet. As the temperature rises, the two axes approach, and those of different colours unite *in succession*; and at the ordinary temperature of the atmosphere, the crystal possesses the singular property of being *uniaxal* for violet light, and *biaxial* for red. When the heat is further increased, the axes which have united open out in order, and in a plane at right angles to that in which they formerly lay, and at a temperature much below that of boiling water, the planes of the axes for all colours are perpendicular to their first position.* The inclination of the optic axes in topaz, on the other hand, *augments* with the increase of temperature, and the variation M. Marx has observed, is much greater in the coloured than in the colourless varieties of this mineral†."

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* *Edin. Trans.*, vol. xi.; and *Phil. Mag.*, 3d series, vol. i., 417.

† *Jahrb. der Chemie*, vol. ix.

In conclusion, then, crystals considered with reference to the effects of heat on them, may be thus arranged :—

THERMOTIC CLASSIFICATION OF CRYSTALS.

Class 1.
Equiexpanding crystals (*single refractors, equiaxed*).

Class 2. Unequiexpanding crystals (*double refractors, unequiaxed*)
- *Order* 1. Di-unequiexpanding (*one optic axis, di-unequiaxed*).
- *Order* 2. Tri-unequiexpanding (*two optic axes, tri-unequiaxed*).

4. *Atoms or Molecules.*—It has been correctly stated by Dr. Brewster,* that the polarizing or doubly refracting structure of crystals must "depend on the form of their integrant molecules, and the variation in their density." A few observations on the atoms or molecules of crystals, will not, therefore, be out of place on the present occasion.

Like all other aggregates, crystals are made up of certain small parts conventionally called *atoms* or *molecules*. It is unnecessary to discuss the question of their finite or infinite divisibility; and to obviate the necessity of this, I shall assume with Dumas,† that an atom is the smallest particle of a body, which by mere juxtaposition with the particles of other bodies, gives rise to a combination. Hence, therefore, the small parts of any one body which combine chemically with certain small parts of another body, without suffering further division, are what we understand by the terms *atoms* or *molecules*.

As these small parts or atoms are invisible, even when we aid the eye by the most powerful microscope, it is obvious that all observations on their size and shape must be speculative. Two opinions, however, have prevailed with respect to their form, Haüy and others have adopted the notion of their *angular* shape, while Hooke, Wollaston, and other more recent writers, assume them to be *rounded*. If we were to deduce the form of the molecules from that of their aggregates, we should adopt the angular hypothesis; for the most minute fragment of a crystal which we can procure and see, is angular. On the other hand, the spheroidal form of the planetary bodies, the tendency which liquids manifest to assume the spherical shape, and the mechanical facilities which the hypothesis of rounded atoms offers in the grouping of the atoms, have led later writers to adopt almost exclusively the views of Hooke and Wollaston.

But it may be asked, Is the shape of an atom constant? or can it suffer change? May not the atoms of liquids be spherical or ellipsoidal and those of crystals angular? Ellipsoidal forms become angular by mutual compression; and hence may not the ellipsoidal atoms of a liquid become angular in the act of crystallization? The idea has not, to my knowledge, oc-

* *Phil. Trans.* for 1818, p. 264. † *Traité de Chimie*, t. 1, p. 33, 1828.

curred to crystallographers, but it appears to me that the subject well deserves consideration.

A spheroid is said to be *oblate*, when, as in the case of the earth, the shortest diameter is its axis of revolution, but it is *prolate* or *oblong*, when the longer diameter is its axis of revolution. Now the shorter diameter may be regarded as the direction of the greatest attraction, or of compression, while the longer diameter is the direction of least attraction or of dilatation. In the case of the earth it is well known that gravity is greater at the poles than at the equator, a body weighing about $\frac{1}{194}$th more at the former than at the latter. It might, therefore, be supposed that crystals with one positive or attractive axis of double refraction would be formed of oblate spheroids, while those with one negative or repulsive axis, would be made up of prolate spheroids.

But an objection exists to this hypothesis. According to it, *obtuse* rhombohedra ought to have one *positive* axis, while *acute* rhombohedra should have one *negative* axis of double refraction. Now the crystalline form of Iceland spar is an obtuse rhombohedron, but the optic axis of this substance is negative, so that its crystalline form is that which is produced by an oblate spheroid, while its optical property is that of a prolate spheroid. To obviate this objection, Dr. Brewster* suggests that the molecules have the form of oblate spheroids, whose polar is to their equatorial axes as 1 to 2.8204, and that they were originally more oblate, but have been rendered less so by the force of aggregation, which dilated them in the direction of the smaller axes.

In point of fact, however, this assumption does not entirely obviate the difficulty, as the spheroids are still supposed to be oblate, though their axis is a negative one; and it appears probable, that the same force which would render the axis negative, should change the shape of the spheroid from the oblate to the prolate. Moreover, Dr. Brewster's explanation involves the improbable supposition that the original very oblate spheroids if "placed together without any forces which would alter their form," would "compose a rhombohedron with a greater angle, and having no double refraction."

On the assumption that the axes of the atoms of crystals bear the same relations to each other that the axes of the systems of crystals themselves do, I have drawn up the following table of the supposed shapes of the atoms:

TABLE OF THE SHAPES OF THE ATOMS OF CRYSTALS.

			Systems of Crystals.
Ellipsoids.	Class 1. Equiaxed (*spheres*)		1. Cubic.
	Class 2. Unequiaxed	*Order* 1. Two equal axes (*spheroids*)	2. Rhombohedric ...
			3. Square Prismatic.
		Order 2. Three unequal axes	4. Right Prismatic..
			5. Oblique Prismatic
			6. Doubly Oblique..

* *Phil. Trans.*, 1830.

[To be continued in our next].

PHARMACEUTICAL MEETING,

JULY 12th, 1843.

MR. MORSON IN THE CHAIR.

ON SOME PREPARATIONS OF BALSAM OF COPAIVA.

BY MR. JACOB BELL.

Balsam of Copaiva has been minutely examined, and its composition is described by several French Chemists. Berzelius also has given a detailed analysis in his *Treatise on Chemistry*, and many persons in this country have experimented on the subject, with the view of separating the active principles, or contriving an elegant mode of administering a nauseous remedy.

There are in the market two varieties of the balsam, which are known on the continent, and distinguished in the French price-lists as the *solidifiable* and the *non-solidifiable ;* the price of the former being about ten per cent. higher than that of the latter. This distinction is not generally observed in this country, and the two varieties are sold indiscriminately, both being considered genuine. This circumstance, together with the occasional sophistication of the article, has given rise to some discrepancy in the statements of Chemists respecting the composition of the balsam. The only tree which is recognised in the London Pharmacopœia, as yielding the Balsam of Copaiva, is the *Copaifera Langsdorfii.* We are, however, unable by any chemical process to identify this product from that of some other varieties of the genus of which fifteen or more are mentioned by Dr. Pereira, and other authorities.

Balsam of Copaiva, as it is usually found in the market, consists of a *volatile oil*, a *yellow hard resin* (called *resin α*, or *copaivic acid*), and a *brown soft resin* (called *resin β*). The substance sold as extract or resin of copaiva is prepared by simple evaporation, and consists chiefly of the hard resin. It is generally considered to possess but little medicinal action on account of its insolubility. A soluble extract is also sold, which is prepared by means of potash or soda, and is a resinate of the alkali resembling a soap.

By boiling the balsam with magnesia or hydrate of lime, the whole is solidified and brought to a pilular consistence, and this preparation is said to be more efficacious than even the balsam itself, while it is less objectionable to the palate. A description

of the process is quoted in the PHARMACEUTICAL JOURNAL, vol. i., page 655, from the *Journal de Pharmacie*.

The solidification is more easily effected by means of lime than with magnesia, the object being attained generally in four or five hours, or even less, with one-fifteenth of the weight of hydrate of lime, while an eighth of calcined magnesia is required to produce the same result in from twelve to fifteen hours. This preparation is sold in France, in the form of sugar-plums, being covered with a coating of sugar. It is also sometimes enclosed in capsules of gelatine.

When balsam of copaiva is boiled with liquor potassæ, the mixture separates into two portions, a white oily substance or emulsion, which floats on a yellowish clear liquid. After standing for a day or two, the upper stratum becomes quite clear, the potash being thrown down, and the residue consisting of essential oil. The clear liquid is a solution of the resin in combination with potash. When evaporated to dryness, it assumes the character of the soluble resin before mentioned. Caustic soda may be substituted for potash.

This liquid is generally supposed to form the basis of a patent medicine, sold as Franks's specific; and it has been thought by some persons to contain the most active and efficacious portion of the balsam. A small quantity of sweet spirit of nitre is added to it in order to increase the effect. The following is a formula adopted by Mr. Rowland, of Liverpool:

Balsam of Copaiva }
Liquor Potassæ ... } of each equal quantities.

Boil for ten minutes, and to each pint (sixteen ounces) of the mixture add two ounces of sweet spirit of nitre. Allow it to stand a few hours, and draw off the clear liquid by means of an orifice in the lower part of the vessel.

On trying this process, it appears that the quantity of liquor potassæ is scarcely sufficient to decompose the balsam effectually; and the addition of a little water is an improvement, reducing the result to a state of dilution, which is more convenient for use, and resembling more nearly the nostrum of which it is an imitation.

The following proportions have been found to answer the purpose. A mixture, thus prepared, is much less nauseous than the balsam, and may be taken in the same doses as Franks's specific; namely, a dessert-spoonful twice or three times a day:

Balsam of Copaiva, two parts.
Liquor Potassæ (or Sodæ), three parts.
Distilled Water, seven parts.

Boil for a quarter of an hour, then add

Sweet Spirits of Nitre, one part.

Separate the clear liquid, as directed above by Mr. Rowland.

This preparation is miscible in all proportions with water, on which account it has been termed *soluble copaiva.* The term, however, is incorrect, as the preparation is merely a solution of the saponified resin, and contains but little, if any, of the oil. It has been supposed that a portion of the oil is converted into resin by the action of the potash, with which it combines. If this theory were correct, we might expect the whole of the oil to be so convertible by continuing the process; but this does not appear to be the case, as the bulk of the oil is found on the surface after the operation.

Patients, who have taken the alkaline liquid, represent its effects as being similar to those of the balsam, but milder and less irritating; and many persons can take it without inconvenience whose stomachs will not bear the balsam in its natural state.

Notwithstanding the efficacy which has been attributed to this preparation, there are many authorities who consider the volatile oil of copaiva the most active and useful constituent, and large quantities of this oil are obtained by simple distillation of the balsam, the residuum consituting the resin of copaiva. The oil is sometimes taken in doses of ten or fifteen drops floating on water, or disguised by mucilage, or some aromatic tincture. This being a nauseous remedy, various means have been adopted for making the oil into pills; for which purpose the following is the best method, although it is by no means an easy operation to accomplish:

Oil of Copaiva, 120 drops (equal to 70 minims).
Soap, 20 grains.
Calcined Magnesia, 2 drachms.

Mix and form into twenty-four pills. It is very difficult to reduce the mass to a proper consistence; and when this is done, unless it be instantly divided into pills, it crumbles into powder, or by continuing the trituration, it becomes liquid and loses all its adhesiveness. When the pills are formed they soon harden, and retain their form perfectly well. Although each pill contains five grains of magnesia, besides the soap, and five drops of the oil, they are not larger than ordinary five-grain pills.

The soluble resin, when soft enough to roll into pills, is too soft to retain its form, unless a little gum and liquorice powder be added, to overcome the tendency to fall. The insoluble resin is more easily managed, by pouring boiling water into the vessel containing it, which makes it soft enough to divide, without dissolving any portion; the pills, on cooling, become quite hard and durable.

Black pitch may be made into pills in the same manner.

Among other preparations of copaiva may be mentioned the

"*Sal Copaibæ*," of Mr. Allen (Briggate, Leeds). The mode of preparing this salt is not published. It was introduced a few years ago, and was tried by Dr. Elliotson and several other medical men in their practice; but the expense of the remedy was an obstacle to its general use, being sold wholesale about 24*s.* an ounce. It was stated by the maker to possess all the properties of the balsam in a concentrated form, the dose being from two to five grains. It was also recommended as an expectorant in combination with oxymel, and in cases of Dysuria with subcarbonate of soda. If the salt possess all the virtues ascribed to it by Mr. Allen it would be a valuable addition to our list of preparations, and the subject deserves further investigation.

There are some practitioners who advocate the use of the balsam in its natural state in preference to any of its preparations, and for those who object to taking it in water order the capsules as the most convenient form for administering the remedy. The method of making the capsules is described in the PHARMACEUTICAL JOURNAL, vol. ii., page 769.

It is stated by Dr. Rees, of Guy's Hospital, that when the balsam of copaiva is taken by itself it may be detected unaltered in the urine in the following manner: Several consecutive doses having been taken at short intervals a portion of ether is to be added to the urine, and, after agitation, it is to be allowed to separate and poured off. The ether dissolves the balsam, and, by exposure to the air for a short time, evaporates, leaving the balsam in the capsule. It is stated that when the balsam is taken with potash this result cannot be obtained, and it might be expected that the alkali, by rendering it soluble, would promote its complete decomposition in the system.

There is good reason to believe that the balsam of copaiva is more efficacious when saponified by means of an alkali, and one of the most common modes of administering it is in the form of emulsion with liquor potassæ. By mechanical suspension with mucilage, or the yolk of an egg, a mixture similar in appearance may be made; but this is liable to separate unless the alkali be added. The following is a good recipe:

℞ Balsami Copaivæ, ℥iij.
Misturæ Acaciæ, ℥vj.
Liquoris Potassæ, ℥iss.
Syrupi Aurantii, ℥ss.
Aquæ Distillatæ, ℥ivss. Misce.

Dose—Two or three table-spoonfuls.

It may be as well to make one remark (which applies generally to oleaginous mixtures in which the oil is suspended by mucilage), that the mucilage should be put first into the mortar and well incorporated with a small portion of the balsam before the

rest is added, and the syrup should be added after the emulsion is completed. Another form of mixture may be mentioned, which some patients prefer.

℞ Balsami Copaivæ,
Spiritus Lavandulæ Comp. ana ʒiij.
Liquoris Potassæ, ʒij. M.

Dose—A teaspoonful in water twice or three times a day.

The lavender serves to disguise the flavour of the balsam. Of all the preparations which have been enumerated, the alkaline solution of copaiva may be considered, in some respects, the least objectionable. Being deprived of the essential oil which, is generally considered to be the most irritating principle, it is mild in its action, and it is less nauseous than the other mixtures on account of the perfect union of the alkali with the resin.

Mr. Mowbray enquired, whether Mr. Bell had not observed a milkiness in the liquid on adding the sweet spirits of nitre to the alkaline solution, arising from the existence of free acid in the spirit? He had observed in Franks's specific that a portion of the alkali was in the state of a carbonate; and he had good reason to believe that it also contained an aromatic—cardamom seeds having been macerated in the sweet spirit of nitre, he had understood, in the proportion of an ounce to a pint. He observed that, commercially speaking, the two kinds of balsam were designated as New York and Para; the former being non-solidifiable, and less esteemed than the other. He said, Mr. Bell had omitted one preparation of copaiva which ought to be noticed, namely, the copaivate of iron, which might be obtained by adding sulphate of iron to the solution of copaivate of potash.

Mr. Bell replied, that he had not met with any inconvenience on adding the sweet spirits of nitre to the alkaline solution, as he conceived that the quantity of potash named was quite sufficient to neutralize any free acid which might be present. He had tried the effect of substituting carbonate of potash for the caustic alkali, and was not at all satisfied with the result, as a very imperfect soap was produced.

The Chairman said it was worthy of remark, that in distilling the balsam in a copper-still, a considerable quantity of copper was dissolved by the resin. He thought the best way of preparing the resin was to evaporate the balsam in an open dish, proper precautions being used to prevent accident by fire.

On the table were specimens of the preparations alluded to in the paper, and also a box of pills made according to the formula.

OBSERVATIONS AND RESEARCHES UPON A NEW SOLVENT FOR STONE IN THE BLADDER.

BY ALEXANDER URE, A.M.
Surgeon to the Western Opthalmic Institution, Honorary Member of the Pharmaceutical Society.

In pursuing some enquiries relative to the treatment of certain forms of urinary disease my attention was directed to the properties of carbonate of lithia, a substance of which no therapeutic application has been heretofore made. It nevertheless occurs as a constituent of various mineral waters; namely, in those of the Kreuzbrunnen of Marienbad, of Klausen, of the Josephsquelle at Bilin, of the Obersalzbrunnen in Silesia, of Lubien in Galicia, of the Kränchen at Ems, and of the Franzensbrunnen at Eger. The four first named waters have, according to Osann, one of the latest and most complete writers on the subject, been found of service in some unhealthy conditions of the urinary organs.*

Carbonate of lithia dissolves in water at the ordinary temperature of 60° Fahr., to the amount of one per cent. From its sparing solubility it may be said to form the connecting link between the earths and alkalis. It possesses a faintly alkaline by no means unpleasant taste. No opportunity has yet been afforded me of ascertaining whether it passes through the circulation unchanged, although analogy would lead to the supposition that such was the case. It has a remarkable affinity for uric acid, so much so, that if finely pulverized *lepidolite* (a hard siliceous mineral containing three or four per cent. of lithia) be boiled along with uric acid in water, urate of lithia is formed. A fact pointed out by M. Lipowitz, and which has been lately verified by myself.

According to the chemist above mentioned, one part of carbonate of lithia dissolved in water and boiled along with an excess of uric acid, dissolves four parts of the latter, which are held in solution after cooling. Urate of lithia is indeed the most soluble salt which that acid forms. It crystallizes by evaporation in the shape of small grains, which require sixty parts of water at the temperature of 60° Fahr. to dissolve them. It contains 14.4 per cent. of lithia.†

In order to determine the solvent powers of carbonate of lithia with reference to uric acid and its compounds, at the common temperature of the human body, I instituted the following experiments:

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* *Physikalisch-medicinische Darstellung der bekannten Heilquellen.* Berlin 1839, page 94.

† Berzelius, *Rapport Annuel.* 1843, page 325.

A solution of one grain of carbonate of lithia in an ounce of distilled water was brought to a temperature of 98°, and pure uric acid gradually added in minute portions until it ceased to dissolve. The quantity thus taken up was 2.3 grains. The resulting solution, which remained unchanged the following morning, being saturated with hydrochloric acid, threw down a precipitate of uric acid, amounting to two grains. Now it will be seen by referring to my paper on the "solvents for calculous concretions," published in the fifth number of the PHARMACEUTICAL JOURNAL, vol. i., that one grain of crystals of soda, dissolved in an ounce of water, took up only one grain of uric acid—that one grain of carbonate of potash took up 1.4 grains—one grain of borax 1.2 grains—and four grains of bicarbonate of soda 1.1 grains. Hence it follows that the solvent power of carbonate of lithia is more than double that of carbonate of soda; nearly double that of carbonate of potash or borax; and about eight times that of bicarbonate of soda, which is the active ingredient of the Vichy water.

A human urinary calculus, now on the table of the Society, composed of uric acid with alternate layers of oxalate of lime, having been most accurately poised, after being previously brought to hygrometric repose, by digesting in fresh urine and then carefully dried, was placed in a solution of four grains of carbonate of lithia, in an ounce of distilled water, and steadily maintained at a blood-heat by means of a water-bath, during five consecutive hours. On being withdrawn, nicely washed, and again dried as before, it was found to have lost five grains in weight, which is at the rate of one grain an hour. The calculus is deeply eroded in different parts, but the delicate laminæ of oxalate of lime remain intact, imparting to the surface the appearance of deep etching. The menstruum acquired a pale yellow tinge, and there fell down from it on cooling a light flocculent deposit of urate of lithia, in which silky crystalline tufts could be discerned by help of the microscope. It was still alkaline to litmus. Decomposed by means of hydrochloric acid, it yielded nearly three grains of pure uric acid.

In another experiment, the remaining half of the same calculus being allowed to stand during four hours in two ounces of the natural Vichy water, from the spring called *Hôpital* (containing three grains and a half of carbonate of soda), was found to have parted with two-tenths of a grain of uric acid; while the former portion of the calculus, placed under precisely similar circumstances, at the same time, in a solution of 1.6 grains of carbonate of lithia to two ounces of distilled water, afforded nine-tenths of a grain of uric acid. Thus is demonstrated the very superior solvent agency of the above feeble lithia solution over the Vichy water.

Half a grain of urate of soda (the ordinary basis of gouty concretions or chalk stones) diffused in an ounce of distilled water at the blood heat, completely dissolved with the addition of one grain of carbonate of lithia, the solution continuing limpid and unaltered; whereas, half a grain of the same urate in a similar quantity of water at a corresponding temperature, rests apparently unchanged, as may be seen in the two phials before you. Urate of soda, as pointed out in my paper on Gouty Concretions, published in vol. xxiv. of the *Medico-Chirurgical Transactions*, is about as insoluble as uric acid.

It deserves notice, that when fresh healthy urine is rendered alkaline by carbonate of lithia, no deposition ensues.

A very large proportion of the stones which occur in the urinary bladder of man, are composed in whole or in part of uric acid. Of all the various menstrua hitherto recommended, none appears to promise more favourably than the carbonate of lithia, from the promptitude and energy with which in dilute solution it attacks calculi of this description. If by means of injection we can reduce a stone at the rate of a grain or more an hour, as the above experiment would lead us to anticipate, we shall not merely diminish the positive bulk of the calculus, but farther loosen its cohesion, disintegrate it, so to speak, causing it to crumble down and be washed away in the stream of the urine. Cases may present themselves in which it may be expedient to conjoin the use of the lithontriptor; but only occasionally and at long intervals. It is the frequency of repetition which renders that instrument so hazardous.

It may be presumed, moreover, that the plan of throwing in a weak solution of this kind, would generally exercise a beneficial influence in obviating irritation, by removing the sharp angular points and asperities of the broken fragments, where the practice of crushing is adopted.

No apprehension need be entertained from the administration of injections, if judiciously directed. Sir Benjamin Brodie found that the bladder bore without inconvenience a stream of fluid composed of two minims and a half of nitric acid for each ounce of distilled water.* An Austrian surgeon has recently introduced vinegar into the bladder, with excellent success, in an instance of phosphatic calculus. Mons. Lisfranc, the eminent French surgeon, has used in like manner tincture of cantharides for the cure of enuresis; and I myself have thrown a dilute solution of nitrate of silver into the bladder, with the best effect, in cases of chronic catarrh of that viscus.

Nothing has hindered me from trying the carbonate of lithia but its extreme scarcity. I would, therefore, suggest the importance of its preparation to the Pharmaceutical Chemist. The

* *London Medical Gazette*, June 1831.

mineral called *spodumene*, which is found at Killiney, near Dublin, contains, according to Stromeyer's analysis, 5.6 per cent. of lithia.

My best thanks are due to Mr. George Knight, of Foster Lane, and to Mr. Morson, for supplying me with the specimens of carbonate of lithia employed in the preceding investigation.

The Chairman, in expressing the thanks of the Society to Mr. Ure, observed, that the subject was very interesting and important, and he had no doubt that the carbonate of lithia might be obtained without much difficulty, if a demand should arise for it.

NOTICES OF SPECIMENS IN THE MUSEUM OF THE PHARMACEUTICAL SOCIETY.

BY MR. THEOPHILUS REDWOOD, CURATOR.

ALOES WOOD.

This is an obsolete article of the Materia Medica, which was once held in very high repute. Pomet, chief druggist to Louis XIV., in his "*Histoire des Drogues*," says, "Of all the woods sold in the shops, we have none more precious, more valuable and rare than the true *wood of aloes*." This is the substance alluded to in scripture where *aloes* is mentioned.* It is described by Dioscorides, Avicenna, and other ancient writers, as a fragrant and aromatic wood. Much difference of opinion has existed as to the tree which affords the *true aloes wood*. It has been ascribed to the *Excœcaria agallocha*, a tree belonging to the natural order Euphorbiaceæ, the juice of which is so acrid as to cause blindness when allowed to touch the eyes; and hence the name from *excœcare*, to blind; and also, probably more correctly, to the *Aquilaria agallocha* and *Aquilaria ovata*, belonging to the natural order Amygdaleæ. Pomet says there are several sorts of aloes wood, but that the best is the Agallochum of India, which comes from Calecut. "The finest," he says, "is the black kind, of a changeable colour, full, heavy, solid, and thick, which cannot be whitened,

Aquilaria Agallocha.

* Psalm xlv., 8. Prov. vii., 17. Canticles iv., 14. John xix., 39.

and is difficult to set on fire. Some persons pretend to affirm, that we cannot have the true *wood of aloes*, and that it grows not in this terrestrial paradise, it having been swept away by the deluge ; and others will not allow it us, because it is not produced among us, except in deserts and upon inaccessible mountains, not only from their height but because of the wild beasts which inhabit among them ; to confute all which, I shall only state, that the ambassadors from the kingdom of Siam, brought of this *true wood*, to present to the king of France, now reigning, a basin, with its salver, proper to wash hands in, made at Siam, after the mode of that country. This basin, though of wood, is more esteemed than if it had been of massy gold, because made of the *true aloes wood*, growing at Bantam, and in China, and which is of the size and shape of the olive-tree, having leaves something after the same sort ; after which grows a little round fruit, like our cherry.

"The chief sign of the goodness of *aloes wood* is, that the chips being put into water will swim, and when burning on fire-coals, they will sweat or fry, afford a sweet scent, and leave bubbles behind them, not easily vanishing. It is hot and dry, cephalic, neurotic, stomachic, cardiac, alexipharmic ; strengthens the brain, heart, nerves, spirits, and whole body ; is excellent against faintings and swoonings, and kills worms by its bitterness. Dose, in powder, half a drachm to a drachm."

Some interesting particulars respecting this wood have recently been published in Kitto's *Cyclopædia of Biblical Literature*, under the head *Ahalim* and *Ahaloth*.

The specimen in the Museum was presented by Messrs. Winstanley and Son.

WOORARI, OR WOURALI, POISON.

(A specimen presented by Mr. Harrison, Charles Street, Berkley Square).

This poison is chiefly manufactured by the Macoushi Indians, who inhabit British Guiana, between the rapids of the Demerara river and the high mountains of the interior. It is employed for arming the points of the arrows which are used by the natives in their warfare, and also in catching wild animals. These arrows are projected by a kind of blowpipe, called a sirvatan. A wound, caused by one of the poisoned arrows, is said to take away life, like a magic wand, without producing the slightest pang.

Considerable doubt exists as to the composition and preparation of the Wourali poison.

Dr. Pereira says, the basis of it is obtained from the Strychnos toxifera.

Orfila adopts the opinion of Bancroft, that it is obtained from some species of climbing plant.

Gray, in his Supplement to the Pharmacopœia, says, "the *Wooraroo poison*, or *balsam arouaroa*, flows from the Icica heta-phylla, and smells like citron."

We are not informed on what data these opinions are founded; but the great interest which the subject at one time excited, and the mystery in which it was enveloped, induced some scientific travellers to endeavour to obtain authentic information on the points in question. In the year 1813, Mr. Waterton, an English gentleman of independent property, having visited Demerara at his own expense, and solely with scientific objects, travelled 800 miles into the interior, for the purpose of ascertaining the precise facts connected with the preparation of the Wourali poison. The privations and toils he endured, during this journey, are detailed in his "Wanderings in South America." All the information he could obtain, amounted to the statement, that the poison is made by the Macoushi Indians, from the Wourali vine and several other plants, the strongest Indian pepper, two species of ants, and the fangs of two species of snakes.

Mr. Waterton's book, however, contains much interesting information respecting the effects of the poison, and the method of using it adopted by the Indians. The arrows which are employed for conveying the poison to the destined prey, are from nine to ten inches long, made from the leaf of a species of palm, hard and brittle, and pointed as sharp as a needle. The blowpipe or tube, from which the arrow is propelled, is from ten to eleven feet in length, consisting of a hollow reed which grows to this length, without any knot or deviation in its diameter, and this reed is enclosed in a case of a stronger material made from a species of palm. Some wild cotton being wound round the end of the arrow to make it fit the hollow of the tube, the practised Indian propels the deadly weapon, by the force of his breath, to a distance of three hundred feet.

At a subsequent period Dr. Hancock, who resided in South America, and chiefly in British Guiana, from the year 1804 to 1828, undertook a further investigation of the subject, the result of which is published in the *Quarterly Journal of the Royal Institution*. He says,

"Having examined the Mandavacs, Francisco and Domingo, two intelligent Indians, who were born and bred on the spot of the tribe most famed for producing the most active worari, and who lived in the vicinity of the mountains which produce both the deadly poison and the instrument of its conveyance, I have received from them separately a most correct and satisfactory account of this affair.

"These Indians stated, that both for the *mavacuri* and *sarsa*, they go up the Siapo and contiguous streams, or about the mountains of Unturan and of Achivucary, as observed by Humboldt.

"They could give, however, no information respecting the flowers; but they knew the plant well, and called it *mavacuri*; and they state, that it is

of the gourd kind, or one of the cucurbitaceæ, of the size of a large orange, round, and having a hard shell, or pericarp, which is used at times to contain the poison.

"The mahwy, they say, is the plant of which they make the blowpipe for projecting the arrow.

"In regard to the manufacture of the poison, they say, that they in general add nothing, though some, to thicken it, add the bark. They merely peel or scrape off the bark, and bruise it well in a mortar. The mass is then put into a funnel, or cartocho, made with wild plantain-leaves, and having a little cotton at the bottom to strain it; plenty of cold water is poured over it, and they proceed in the same manner as in drawing the lixivium of ashes. This infusion is put into an earthen pot, and boiled down to a proper consistence.

"This was related circumstantially by Domingo and Francisco separately. They had no idea of the addition of other substances (ants, &c.), serving, in reality, only to dilute, and render the poison less active, as prescribed by the Indians living near our settlements; all of which are but inventions, like those of the charlatans of Europe, to throw mystery over the affair, and enhance the value of the art."

The following extract from a letter addressed to Dr. Hancock by Mr. J. Forsyth, contains some further information on the subject.

"I received your letter of the 30th ult., requesting a specimen of the worari vine. I am sorry it is not at present in flower; but I send you a small branch of it, and two other vines, called *worarybally* and *courampoey*, which the Indians use as auxiliaries to strengthen the former. You will also receive two small roots of the worari vine, which will grow if immediately planted; it will require a great proportion of sand mixed with the earth it is planted in, as it is found growing on sand-hills.

"The mode of preparing the poison is as follows:—The inner bark or rind of the root (for it is the root only that is used), is scraped off into some vessel. The worarybally-root undergoes the same process; but it is the vine itself of the courampoey that is used. To these, mixed together and well boiled down with some water, the Indians add some peppers, and further boil the whole mass to a thick syrup.

"This account of the process, I have had from the Indians; but they are to bring some of these roots, &c., and make the poison in my presence. I shall, therefore, have it in my power, I hope, hereafter, to give you a more accurate description of this process."

In a communication made by Dr. Hancock to the Medico-Botanical Society, in 1837, he adds to his previous statements, that in the preparation of the poison by the Macoushi's, the slimy barks of the kyheri and quasima are added to give tenacity to the extract.

Dr. Hancock has remarked, that,

"If such a thing does exist in nature as a direct sedative, in the strictest sense of the term, I should imagine it to be this extraordinary vegetable extract. Its operation on the animal frame is most mysterious. It extinguishes the vital spark without a pang or a struggle, if prepared without any other substance being added; for the most efficient poison is prepared from the worari vine alone. The sensation and effect it produces are extremely analogous to those which arise from excessive bleeding—the animal under its influence sinking from existence in the most placid swoon."

It appears that the Indians are acquainted with means for

recovering animals from the effects of the poison, and are in the habit of shooting monkeys, birds, &c., with the poisoned arrows, and after bringing them to the ground, resuscitating them; by which means they carry on a considerable traffic in these animals.

In "Mayo's Outlines of Physiology," a case is described in which a horse, suffering from a severe attack of tetanus and locked-jaw, the mouth being too firmly closed to admit the introduction of either food or medicine, was inoculated on the fleshy part of the shoulder with an arrow point coated with the Wourali poison; in ten minutes apparent death was produced. Artificial respiration was immediately commenced and kept up about four hours, when reanimation took place; the animal rose up apparently perfectly recovered, and eagerly partook of hay and corn. He unluckily was too abundantly supplied with food during the night. The consequence was, over distention of the stomach, of which the animal died the following day, without, however, having the slightest recurrence of tetanic symptoms.

Sir B. Brodie, in two papers read before the Royal Society in 1811 and 1812, has described the results of some experiments performed with this poison.

"Some woorara was inserted into a wound in a young cat. She beeame affected by it in a few minutes, and lay in a drowsy and half sensible state, in which she continued at the end of an hour and fifteen minutes, when the application of the poison was repeated. In four minutes after the seeond application, respiration entirely eeased, and the animal appeared to be dead, but the heart was still felt acting about one hundred and forty times in a minute. She was placed in a temperature of 85° Fahr. and the lungs were artificially inflated about forty times in a minute. The heart continued acting regularly. When the artificial respiration had been kept up for forty minutes, the pupils of the eyes were observed to contract and dilate, on the increase or diminution of light, saliva had flowed from the mouth and a small quantity of tears was collected between the eye and eye-lids, but the animal continued perfectly motionless and insensible. At the end of an hour and forty minutes, from the same period, there were slight involuntary contractions of the muscles, and every now and then there was an effort to breathe. The involuntary motions continued, and the efforts to breathe became more frequent. At the end of another hour, the animal for the first time gave some signs of sensibility when roused, and made spontaneous efforts to breathe twenty-two times in a minute. The artificial respiration was discontinued. She lay, as if in a state of profound sleep for forty minutes, when she suddenly awoke, and walked away. On the following day she appeared slightly indisposed; but she gradually recovered, and is at this time still alive and in health."

Sir B. Brodie found that the best method of applying the poison was to mix it with water to the consistence of a thin paste; then to make a wound, and smear the poison over it with the end of the scalpel. He also found that the effect was more speedy and certain, if there were some, but not much, hæmorrhage.

It is necessary to keep the wourali in a perfectly dry state; and when thus preserved, it appears to retain its properties for a

considerable number of years. Mr. Iliff* applied some which had been thus kept for twenty-seven years, and it killed the animal in a few minutes. Dr. Hancock and Mr. Iliff both state, that the poison may be taken into the stomach without injury, a considerable quantity having been administered to animals, by the mouth, without producing any sensible effect.

THE FRUIT OF THE CAROB-TREE; OR, ST. JOHN'S BREAD, Is the produce of the *Ceratonia siliqua.* The name, *Ceratonia*, of this plant, is derived from κερας, *a horn*, in allusion to the horn-like appearance of the pod. The pods have been imported from Spain under the name of *Algaroba beans*,† the tree being known in that country by the name of Algaroba. There is, however, another tree, the *Prosopis pallida*, a native of Chili, which is called Algaroba.‡ The Arabic name of the Carob-tree is *Kharroùb*, from which the English name is derived.

This tree, which belongs to the natural order Leguminosæ, is common in the South of Spain, where both the pod and the seed or bean are used as food for man and beast. The seeds are said to have formed a principal article of food to our cavalry horses in Spain, during the war of 1811 and 1812. The pods contain a large portion of sweet fecula, on account of which they are frequently eaten; and popular opinion having identified this with the wild honey spoken of in scripture as the food of John the Baptist, the name of St. John's bread has been given to it.

The pods have been recommended for improving the voice, and are employed for this purpose by singers.

This specimen was presented by Mr. Squire.

MR. FOWNES'S LECTURE ON ELECTRICITY.

On Wednesday evening, the 26th of July, Mr. Fownes delivered his lecture, as announced in our last number. He commenced by tracing the early history of the science, and explaining the phenomena which gave rise to its establishment. Having in a very clear and perspicuous manner described the different kinds of electricity and their sources, and briefly alluded to electrical induction, he proceeded to point out the connection between electricity and chemical action, of which a variety of illustrations were given, especially in the process of electro-plating; and several beautiful specimens of this process were exhibited from Messrs. Elkington's.

* *Medical Gazette*, vol. xx., p. 280.

† Loudon's *Encyclopædia of Plants.*

‡ Captain Bagnold, in "The Transactions of the Society of Arts," vol. xlix. p. 98.

OTHER ORIGINAL COMMUNICATIONS.

THE PREPARATION OF PURE IODIDE OF POTASSIUM.

Messrs. T. and H. Smith have forwarded to us the following observations, in reply to the remarks made at the Pharmaceutical Meeting of June 14th, on their paper:

In reference to the remarks of Mr. Redwood on our process, we may say, that we know of no method for preparing hydriodic acid that is not incomparably more troublesome and tedious than the preparation of the solution of iodide of iron, used by us for neutralising the excess of alkali.

The assertion that the substitution of hydriodic acid will obviate the necessity of filtration, fusion, and the use of alcohol, is not correct. Filtration cannot be avoided, whatever method may be adopted, and, as the object in fusing the salt is to remove colouring matters, which would injure its beauty and purity; and as these already exist previously to neutralization, and can only be got rid of readily in this way, the necessity for fusion does not become in any respect less. Neither will it render the use of alcohol less requisite, for as this is employed to separate the iodide from the impurities communicated through the medium of the alkaline carbonate, they will be present, whatever plan we may use for neutralizing its excess; but to show how very trifling is the quantity of spirit required in our process, we may mention, that in lately preparing a quantity of iodide of potassium, from 72 ozs. iodine no impurities made their appearance till the mother liquid was reduced to less than one ounce.

EXTRACTUM CANNABIS INDICÆ.

(communicated by mr. savory).

Take of Gunjah (bruised fine) 4lb avoirdupois.
Rectified Spirit (0.838) 5 gals. old m.

Macerate the gunjah in two gallons of the spirit for seven days, then strain off, and add one gallon more of the spirit; let this stand four days, and strain; mix the two tinctures and filter; then boil the hemp in the remaining two gallons of spirit for fifteen minutes, and filter *while hot.*

Let all the tinctures be mixed, then distil off the spirit, and evaporate the remainder in a water-bath to the consistence of an extract. (Produce—twelve ounces).

ON THE PRESERVATION OF ROOTS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

87, *Lisson Grove*, 6*th* July, 1843.

My dear Sir,—I have received the July number of your useful Journal, and I beg leave to call your attention to a typo-

graphical error therein, the words TREE roots should be TRUE roots*.

Large roots dry spontaneously more readily in their entire state than when sliced, and their juices are then not exposed to the influence of the atmosphere, which is a matter of some importance. I believe the juices of leaves are less liable to deterioration by being inspissated in their own cells than they are by being formed into extracts, however carefully the process may be conducted. I am led, by long experience, to prefer the pulv. fol. conii. to any other preparation of the leaf.

I am, my dear Sir, yours, very truly, JOSEPH HOULTON.

EMPLASTRUM CERATI SAPONIS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

London, 11*th July*, 1843.

SIR,—I see in the present number of your Journal some remarks on the Emplastrum Cerati Saponis, which has induced me to state that the ceratum saponis of the shops is frequently an article unsuited to the purposes for which it is wanted by the practical surgeon; it is too oily and hence not sufficiently adhesive; perhaps, this is from the instructions of the present Pharmacopœia being not sufficiently explicit on the points of manipulation. In the *Pharmacopœia Chirurgica* the following are the directions which may perhaps be acceptable to your readers:

"Boil the vinegar with the oxide of lead over a slow fire, constantly stirring them till they become united and glutinous; then add the wax, oil, and soap, previously melted together; observing that the temperature of the two compounds be nearly at the same degree when they are blended with each other; the whole should again be effectually and constantly stirred till the cerate is nearly cold. In making this preparation the greatest possible caution is required, the fire should never be too rapidly applied, the stirring should be uniform and incessant, and the heat should only be sufficient to keep the two compositions liquid at the time when they are united."

I am unable to give any opinion on this mode of preparation, but from the authority with which it comes I should think it deserves a trial. No good practical surgeon likes to be without good ceratum saponis, but it is sometimes difficult to be obtained. Some Chemists, I believe, spoil it by trying to improve it, from not knowing the peculiar uses to which it is applied.

I am, Sir, your obedient Servant,

CHIRURGUS.

[The want of adhesiveness in the *Ceratum Saponis* is chiefly occasioned by the presence of vinegar; but even when this is evaporated, and the compound is thus reduced to the consistence of a plaster, it is less adhesive than those plasters containing resin. We imagine that in many cases for which the cerate is employed, the presence of resin would be more objectionable than the deficiency of adhesiveness.—ED.]

* See page 42.

DRIFFIELD OILS FOR CATTLE.

Mr. Harris (of St. Albans) has sent us the following receipe:

Rape Oil, 1lb
Spirit of Turpentine
Barbadoes Tar of each, ½lb
Oil of Thyme, 1 oz.
Sulphuric Acid, 3 oz. Mix.

A "Yorkshireman" has sent another version, and informs us that this compound is named after the town of *Driffield*, in Yorkshire, and is used as an external application to sore backs and shoulders, bruises and wounds in cattle; and is called in Yorkshire "Black Oils:"

℞ Petrolei Barbadensis, ℥j.
Olei Seminis Lini, 1lb.
Olei Terebinthinæ, ℥iij.
Acidi Sulphurici, ℥iss. Misce.

Another correspondent sends the following:

℞ Ol. Lini. ℥xxxvj.
— Viridis, ℥xiij.
Petrol. Barbadensis, ℥iv.
Olei Terebinthinæ, ℥xxiv.
Acid Sulph., ℥iij. M.

Mix the tar with the turpentine, then stir in the oils; lastly, add the acid, and shake the bottle frequently for a quarter of an hour.

"A Veterinary Student" sends the following:

Pale Southern Oil, 3 pints.
Oil of Turpentine, 1 pint.
Sulphuric Acid, 2 ounces.—Mix *sec. art.*

This is similar to a compound called Farriers' Black Oils, which is used to promote the process of granulation in muscular wounds.

EXTRACTED ARTICLES.

NOTICE TO THE MANUFACTURERS OF QUININE.

Kinic acid has become of great importance to the Chemist, in consequence of the recently discovered chemical changes of which it is susceptible. We beg, therefore, of the manufacturers of quinine to save, for scientific purposes, a portion of the hundreds and thousands of pounds of this acid lost in the manufacture of quinine, and to bring it into the market. — *Annalen der Chemie und Pharmacie*, April, 1843.

NEW ASTRINGENT PREPARATION OF RHATANY.

By digesting rhatany root in sulphuric ether, a brown extract is obtained, which is perfectly soluble in distilled water, and causes a powerful sensation of astringency, followed by heat and dryness, when placed on the tongue. This extract, invented by M. Tissier, of Lyons, has been employed with success in that city in passive hæmorrhages, particularly those consequent on non-contraction of the uterus, occurring after prolonged labours and miscarriages. It has also been used with advantage for leucorrhæa, blennorrhæa, gleet, &c. The dose in which it has hitherto been employed, is a table-spoonful of a mixture composed of from five to ten grains of the extract in six ounces of some appropriate vehicle. In leucorrhæa, topical injections are recommended of from two to five grains of the extract in a pint of barley-water. The presence of this preparation in the stomach, gives rise, generally, to a sensation of heat in the epigastrium, though this rarely proceeds so far as to become painful; great thirst, and a pulse often

as full as in gastritis, also prevail. These symptoms are, however, transient, and rapidly quelled by lemonade, or other mild drinks. Should the injection irritate the urethra too greatly, it is only necessary to suspend its use for a short time.—*Gazette des Hôpitaux* and *Lancet.*

ON THE COLOURING PROPERTIES OF ALOETIC ACID.

BY M. BARRÈSWILL.

Aloetic acid * melted with colophony becomes of an intense blue colour. The author has not hitherto been able to extract the colouring matter ; but he remarks, that the resin, thus coloured blue, dissolves easily in alcohol, in the essences, and in fatty bodies—which allows of its being used for colouring these substances, and also for injections. The colouring power of the aloes blue is very considerable. A few grains of crude aloetic acid, melted with about five drachms of resin, is sufficient to colour a pound of fat.

REVIEW.

Handbuch der Chemie.† *Von* Leopold Gmelin, *Geheimer Hofrath und Professor in Heidelberg. Erster Band, Vierte, umgearbeitete, und vermehrte Auflage, Heidelberg, Universitäts Buchhandlung. Von* Karl Winter, 1843.

COMMUNICATED BY DR. URE.

No system of chemical knowledge has ever enjoyed, in Germany, so extensive, so durable, and so well merited a reputation, as that of which the first volume of the fourth edition is now before us. Distinguished no less by the importance and precision of his original researches in every department of Chemistry, but especially in animal physiology, the most difficult of all, than by his comprehensiveness, perspicuity, and candour, as a systematist, the author brings to the performance of the present great task, or *Manual*, as he modestly terms it, qualifications of the highest order. Equally copious and faithful in the narrative of facts, and choice in their selection as is the great Lehrbuch of Berzelius, the *Handbuch* of Gmelin is much more methodical in their detail, and incomparably more minute in its references to the fountain-head of information. In these two latter respects, indeed, the present treatise is unrivalled in the annals of chemical science. The 903 pages which compose the first volume, have as many well digested facts condensed into them, by the joint aid of style and typography, as would be spread over 3000 pages of other recent books upon the same subject.

Much of the valuable knowledge comprised in the Lehrbuch of Berzelius is so homologated by his synthetic spirit, as to be hardly traceable to its source ; whereas in the *Handbuch*, every new statement of any consequence, is definitely quoted from the

* Aloetic acid is obtained by treating aloes with nitric acid.

† *Manual of Chemistry.* By Leopold Gmelin, Privy Counsellor and Professor in Heidelberg. First Volume of the Fourth Edition, recomposed and enlarged. Heidelberg, University Press. Karl Winter, 1843.

parent work. There are two modes of expounding Chemistry in a book written for beginners. By the one, we seek to present, as far as possible, a collection of monographs of the simple bodies, and of the combinations which they reciprocally form, and to arrange them in some convenient order, pointed out beforehand, so as to avoid the risk of repetition. Thus the science may, according to Berzelius, be reduced to its most simple exposition, and most effectually impressed on the mind of the student. By the other, all the simple bodies are first examined in order, next their several mutual combinations are reviewed in succession, and then the compounds of these combinations with each other, proceeding regularly from the more simple to the more complex.

The first method is that aimed at, though not closely followed, by Berzelius; the last is the one pretty rigidly adhered to by Gmelin. Each has its advantages, but for a great work of reference, that of Gmelin is clearly preferable.

Fifteen years have elapsed, since the first volume of the third edition of the *Handbuch*, and twelve since the last volume of it appeared. "In this interval," says our amiable author, "the labours of a daily increasing number of friends of Chemistry, have augmented the subject matter of the work in an unprecedented degree. The charge of bringing out a new edition has hence become indispensable, as has been suggested to me by the friendly applications of many distinguished Chemists. I have now the satisfaction of presenting the first volume to the scientific world, with the assurance that, under existing circumstances, the remainder of the work will speedily follow. I have studied, in the present edition, still more than in the preceding, to incorporate into a systematic whole, every fact which appears to be worthy of confidence, carefully referring it to its first observer or source, as completely and minutely as I could, compatible with due brevity. Thus the work may serve not only to communicate fundamental instruction in the Chemistry of the present day, but to indicate the original storehouse from which I have made my selection, so that others may be guided directly to the spot. I have also sought to render this edition more generally useful than the previous one, by embracing in its details a fuller exposition of the most important subjects of pharmaceutical, technical, and analytical Chemistry. This enlargement of the plan, has occasioned a change in the title, into a *Manual of Chemistry*, instead of a Manual of Theoretical Chemistry. The several sections of the work have been in a great measure written anew, though the general distribution of the parts has been preserved; with the exception of some of the compounds of carbone, such as the gaseous hydrocarbures, croconic acid, the compounds of

carbone with iode, brome, and chlore, as also cyan, with its whole range of correlatives, which have been transferred from the inorganic to the organic department."

Professor Gmelin has, moreover, adopted in this edition, the views of the atomic theory, as expounded by Dalton and Prout, in which hydrogen is taken as the radix, or 1; carbone, 6; oxygen, 8; azote, 14; sulphur, 16, &c., as multiples of hydrogen by a whole number. This simplification must recommend the work much to all students, but particularly to those of the United Kingdom. He has discarded the equivalents or double atoms of Berzelius, Dumas, and Liebig; assigning very satisfactory reasons for so doing. The atomic numbers of Berzelius are given apart.

Gmelin's nomenclature deserves praise for its simplicity, uniformity, and absence of idle innovation, which is too much a mania with modern authors. It is much to be wished that the English language in Chemistry were assimilated more closely to that of its Saxon parent. Kali and kalium, natron and natrium, names known in our old pharmacopœias, are better than the fantastic terms potash and soda. *Hydrotheion*, a Greek compound of hydrogen and sulphur, is shorter and more euphonous than sulphuretted hydrogen. Sulphure, phosphure, carbure, chlorure, iodure, cyanure, &c., are less cacophonous than the same words with a superfluous *t* tacked to their tail. We might also adopt with advantage the distinctions of chlorure and chloride, iodure and iodide, cyanure and cyanide, &c. to denote the compounds of one and of two atoms of chlore, iode, cyan, &c. with other bodies; and in cases, where there are more than two atomic compounds of any one of these bodies with others, we should prefix the Greek numerals, as dichlorantimony, trichlorantimony, tetrachlorantimony, pentachlorantimony, &c. Such slight changes of our chemical nomenclature could hardly be called an innovation; and they would be intelligible without a glossary. In cases where only one combination of a substance with chlore, cyan, &c. is known, then that prefix alone should be used, as chlorsilver, cyankalium, &c.

The contents of the first volume of the *Handbuch* are, after a short preface, distributed under the following heads:

1. *Introduction;* 2. *Cohesion;* 3. *Adhesion.*

Chemistry Proper. Part I. *Generalities; Affinity.*

" II. *Special Chemistry.*

1. Section—Chemistry of Imponderables.

Chap. I. Light. II. Heat. III. Electricity and Magnetism.

2. Section—Chemistry of Ponderables.

I. Division—Chemistry of Inorganic Substances.

I. Subdivision—*Non-metallic Principles.*

Chap. I. Oxygen. II. Hydrogen. III. Carbone. IV. Boron.

V. Phosphorus. VI. Sulphur. VII. Selen. VIII. Iode. IX. Brome. X. Chlore. XI. Fluore. XII. Azote.

Under the title *Cohesion*, the author treats in succession of the *Cohesion of Liquids;* and next, that of solids, which is best exemplified in crystallization.

Under *Adhesion*, he discusses the principles of the diffusion of gases: 1. By themselves; 2. As modified by fissures and pores of their containing vessels, or separating media, as stoneware, gypsum, caoutchouc, animal membranes. He then treats of the adhesion between elastic fluids and different solids; and, lastly, between liquids and solids; under which latter head, he investigates, very ably, the curious phenomena of endosmose.

Each of his main divisions, sub-divisions, and chapters, is introduced by a copious list of references in chronological order, to the authors who have treated particularly of that peculiar subject.

The article *affinity* is the most complete dissertation which has hitherto been published, illustrative of this great chemical doctrine, and occupies no less than 125 pages of condensed typography, with innumerable references, ingeniously intercalated in the text.

He gives, first, general views of affinity; second, A sketch of its extent; third, An exposition *(Bildung)* of chemical combination.

He then considers, first, the conditions under which combination takes place, with the circumstances and results of the combinations of ponderable principles. Here Stöchiometry, or the doctrine of chemical proportions, and the atomic theory, are investigated in a detailed and masterly manner, accompanied with several valuable original tables. The professor next examines into the new properties of bodies resulting from combination; as the change of density, state of aggregation, crystalline form; under which last head, isomorphism, in its numerous interesting features, is systematically expounded: then, the relations to heat, relations to light, chemical and physiological relations. In an Appendix to the change of properties consequent on combination, the interesting topics of dimorphism, trimorphism, and amorphism are discussed. This division of the work is concluded with an account of isomeric, polymeric, and metameric bodies. Our author enters next upon the subject of chemical decomposition, classed under the following heads:—First, The conditions under which decomposition takes place; second, Circumstances and results of decomposition; third, The strength of affinity, or its relative force among rival attracting substances. Here we have the order of affinity among several important bodies represented in a compact form. We shall quote one example as a specimen of his admirable method:—

"*Muriatic Acid:* 4 Pb O, Na O, Ba O, Sr O, Ca O, Mg O, N H_3, Co O, Ni O, Hg O, Ce O, Zn O, Mn O, Fe O, U O, Au O_3 (?), Cu_2 O, Cu O, Sn O, G O, Al_2O_3, U_2O_3, Cr_2O_3, Fe_2O_3, Su O_2, Bi_2O_3, Sb O_3. Compare Schnaubert, Anfrye and Darcet, Gay Lussac and especially Persoz (*Ann. Chim. Phys.* 58, 180; also *J. pr. Chem.* 6, 32). Persoz places the copper oxidule above the copper oxide, without any experimental proof, and undoubtedly wrongly. As to 4 Pb O, compare p. 136."

The extensive subject of chemical attraction is completed by an investigation of its causes and nature, of the atomic notions of the ancients, and the modern atomic theory. We have here an excellent examination of Berthollet's *anti-atomic* views of indefinite combination, as pompously expounded in his chemical statics. We shall quote under this head an example of the professor's critical powers.

"1. Berthollet," says he, "failed to demonstrate his first and main proposition, that the general attractive forces of nature, and those of affinity are identical. He assumes, indeed, that the several elementary bodies, possess greatly differing affinities towards each other; but he does not explain how the mutual gravitation of the molecules, can exercise that peculiarity of action, which modifies so remarkably, in chemistry, the laws of universal attraction.

"2. Unacquainted as Berthollet was with our modern Stöchiometry (when he published his Statics*), Berthollet maintained that two elements could combine in all proportions, and sought to show by experiments, that the combinations seldom took place in determinate proportions, and when they did so, that the proportions were determined by extrinsic circumstances, by cohesion, density, or elasticity; either in the new compound, or in one of the substances concerned. But had he been asked, why chlorine combines with hydrogen (both gases) only in one definite proportion, whatever quantities of the two are mixed, he could have given no answer; for in this case, without either condensation or expansion of volume, a definite acid compound is formed.

"3. Granting that the quantity of a substance sometimes exerts an influence upon the phenomena of affinity, we know that when adhesion does not co-operate, only that quantity of the substance acts, which can constitute a definite compound. Thus, one atom of carbone at the utmost, can combine with one atom of oxygen; and if 100 atoms of carbone be present, no more can force themselves into union with the atom of oxygen.

"4. Berthollet's doctrine that one substance, A, parts itself between two rival substances, B and C, in the ratio of their respective chemical masses, has an appearance of truth only in those cases, where the mutually operating bodies are contained in a liquid, like water, and where both they, and their supposed combinations are soluble therein, so that no direct indication can be had, as to which compound is actually formed; whether, according to the common views, A has combined with C, and B is set free; or, according to Berthollet's, two compounds, A B and A C, are produced. In certain cases, however, this dilemma may be avoided, and the erroneousness of Berthollet's notions be made manifest. Boracic acid tinges litmus of a claret colour; sulphuric acid, scarlet. To a solution of borax in hot water, blued with litmus, if sulphuric acid be added to saturate the soda of the salt, the liberated boracic acid will change the purple colour of the litmus to claret; if there be

* He lived, however, many years, after the Daltonian doctrines of atomic combination were universally adopted by Chemists, without recanting his errors.

now the faintest excess of sulphuric acid, even $\frac{1}{500}$th part, the scarlet tint will be produced. But had there been, on the introduction of the sulphuric acid, that partition of the two acids between the base, which should have resulted on Berthollet's principles, then the scarlet colour should have appeared long before so much sulphuric acid had been added, as to saturate the base. On the same doctrine of partition, when a boiling solution of boracic acid is poured into solution of sulphate of soda, tinged with litmus, some sulphuric acid, however little, should be eliminated; but, on the contrary, there is none, as is proved by the claret colour of the tincture. Litmus is instantly decoloured by chlorine; but not till after some days by iodine. With a solution of sea-salt tinged purple with litmus, if abundance of iodine be mixed, this should, according to Berthollet, displace by its mass, a certain portion of chlorine ; but it does not, as is evinced by the litmus keeping its colour however faint, and easily destroyed by a minute quantity of chlorine.

Red phosphate of iron dissolves in muriatic, but not in acetic acid; and from solution in the former, it is completely precipitated by acetate of potash. "Now, were Berthollet's principles just, the whole of the acetic acid thus set free, ought to retain in solution some portion, however minute, of the oxide of iron—but it does not, and, therefore, there is no partition. When oxalate of lead is mixed with water, with as much sulphuric acid as is equivalent to the oxide of lead, the whole of the oxalic acid is separated, and none of the sulphuric acid remains free. Thus also oxyiodate of lead, digested with its equivalent of sulphuric acid (diluted with water), becomes a pure sulphate of lead, and leaves no vestige of the oxyiodate. In contact with water, chlor-silver is readily and completely decomposed into metallic silver and solution of chlor-iron ; whereas the inverse decomposition should take place on Berthollet's principles, since the iron has more cohesion than the silver, and the chlor-silver is quite insoluble, while the chlor-iron is very soluble in water.

"These last three experiments show moreover, that salts, which are insoluble in water, such as oxalate of lead and chlor-silver, are not on that account placed beyond the sphere of chemical attraction. It has been shown by Gay Lussac, that a metallic oxide insoluble in water, can precipitate another oxide completely from its combination with an acid, thus oxide of zinc will separate the whole oxide of silver from a solution of the nitrate of this metal.

"Three atomic proportions of iron melted along with one of trisulphure of antimony, abstracts the sulphur completely from the antimony ; although none of the substances is separated in either the solid or the elastic state, but on the contrary, the fused sulphure of iron floats over the fluid antimony.

"It has been shown (p. 126) that muriatic acid displaces carbonic acid from carbonate of lime, even under such a pressure as retains the latter acid in a liquid state, and that muriatic acid used merely in equivalent proportion, forms a perfectly neutral solution of muriate of lime (chlor-calcium) as may be seen by the tint of litmus in it. Now, since the muriate of lime is a very soluble salt, and its carbonate an insoluble one, the inverse result ought to follow, when the escape of the carbonic acid is prevented. We may also advert to the decomposition of sulphite of lime by muriatic acid, although the sulphite is nearly insoluble, while the resulting muriate is extremely soluble, and moreover the muriatic acid gas possesses more elasticity than the sulphurous, as appears by the more difficult liquefaction of the former than of the latter by pressure."

Having thoroughly demolished this long elaborate web of sophistry, in which chemistry was for many years fantastically enrobed by its learned Professors, our author comes to the con-

clusion that chemical combinations are caused by a specific attractive force, to which the (somewhat metaphorical) name *chemical affinity* has been given. He then proceeds to examine the hypothesis which ascribes this *attraction* to electrical forces, of various intensities and qualities, residing in the elementary atoms, or what is commonly called the electro-chemical theory.

We find in this part of the work, a succinct but luminous exposition of the most prominent facts which have been advanced upon this mysterious and unsolved problem.

The first three chapters of Special Chemistry, which comprehend light, heat, and electricity, present most elaborate systematic details of almost every important fact and discussion upon these recondite imponderables, or Archæal powers. We find here, in particular, the best summary hitherto published of the discoveries of Professor Faraday, which do so much honour to himself and his country.

The subdivision entitled Chemistry of Inorganic Combinations, is introduced, like all the other sections, by a systematic outline of its contents. But the space assigned to such a notice as the present, compels us to finish with a brief abstract of the author's review of the Binar theory of salts, which has been rather hastily adopted and generalized by some of our leading chemists.

"Sir H. Davy," says he, "was the first to suggest the idea, that chlorate of potash (chlorkali) might be regarded not as a compound of chloric acid and potash ($Cl\,O_5$, K O), but one of chloric acid + 1 atom of oxygen, with one atom of potassium (kalium) or $Cl\,O_6$, K; and that in like manner, nitre, might be considered, as a compound not of nitric acid and potash ($N\,O_5$, K O), but of nitric acid + one atom of oxygen, with one atom of potassium, $N\,O_6$, K. Thus also, oil of vitriol may not consist of an atom of dry sulphuric acid with an atom of water ($S\,O_3$, H O), as all the world has been accustomed to conceive; but may be a compound of a new base, $S\,O_4$, containing one atom of sulphur and four of oxygen, with one atom of hydrogen, as the acidifier; and therefore, represented by the symbol $S\,O_4$, H. When this suppositious atom of oil of vitriol unites with an atom of kali (K O), the oxygen of the latter pairs off with the hydrogen of the former to make water, and the other components go together ($S\,O_4$ K). When oil of vitriol and kalium meet ($S\,O_3$ H O, K), or on the new plan, $S\,O_4$ H, K, the conflict which ensues is not to be regarded as oxidizement of that most easily oxidable metal, joined to the union of the oxide with the acid (each of which events is otherwise known to produce fervent commotion); but is to be viewed simply as the dismissal of the spare atom of hydrogen in a gaseous form (which should produce cold), and as the union of the potassium with the ideal base of *quater* oxygenated sulphur. What turmoil, the latter combination may excite, nobody can tell; for the whole land is *terra incognita*."

We shall not perplex our readers with the new nicknames assigned to these new chemical radicals, as both will vanish ere long, but content ourselves with showing how easily Gmelin clears up the mystification, and in the impress of demonstrative realities, presents his readers with the obverse of that counterfeit coinage of the brain.

"1. The binar hypothesis," says he, "assumes the existence of several

combinations whose entity or identity is unknown ;* such as the tetroxide of sulphur ($S O_4$); the hexoxides of azote ($N O_6$), and of phosphorus ($P O_6$); the heptoxide and the octoxide of phosphorus ($P O_7$, $P O_8$); and thus overlays chemistry with a troop of chimerical *incubi*.

" 2. Several oxygen acids will not, however, lend themselves at all to this radical equivocation ; for example, carbonic and chromic acids, for no such salifiable hydrates exist as can be figured by the symbols $C O_3 H$, and $Cr O_4 H$, so that in these and the like realities, the compounds of hydrogen with this new salt radical are nonentities.

" 3. It is not possible to divine the use or limits of the binar theory ; for if *all* the oxygen salts be not comprehended by it, it does not serve the purpose for which it was conjured up; which was to embrace the *amphide* and the *haloid* salts in one category †. If we allow to the theory its legitimate range over the whole of the *amphide* salts, we must regard not only silicate of soda ($Si O_2$, $Na O$) as $Si O_3 N$, and likewise the salts of the weakest acids, but also spinell ($3 Mg O$, $Al_2 O_3$) as $3 Mg Al_2 O_6$, and the hydrate of potash ($K O$, $H O$) as $K H O_2$. The last travesty involves the monstrous proposition, that peroxide of hydrogen (oxygenated water of Thenard) can exist quietly in contact with potassium, without any mutual action ! What a wonderful force of affinity must the binar theorists suppose to exist here in hydrogen towards the really second atom of oxygen, as also between sulphur and its fourth atom of oxygen, in the imaginary $S O_4 K$, to overbalance the intense affinity which is known to exist between potassium and oxygen. Or to take another view, what must be the strength of affinity between K, and the salt radicals $S O_4$ and $N O_6$, to outweigh that of potassium for oxygen. And if we extend this theory to the compound salts of the second order, we needlessly create a crowd of hypothetical combinations, with a concomitant Babylonish dialect. Let us consider one of the double salts, such as sulphate of zinc and potash, when placed in this novel light. Instead of its plain expression $S O_3 K O$, $S O_3 Zn O$, we shall have $2 S O_4$, $Zn + K$; and thus create a compound of K, which differs from the other, by merely one more constituent. But that this formula cannot be the true expression of the state of combination of the bodies will be universally allowed.

" 4. Even Graham (Lehrbuch, ii., 147) adverts to the awkward dilemma that as one atom of potash can combine with both one and two atoms of sulphuric acid, there must be created for the two resulting salts, two different salt radicals, $S O_4 K$, and $S O_5 K$.‡ Thus also, one atom of potash combines with one, two, or three atoms of chromic acid, and, therefore, on the binar theory, three different radical ghosts must be here conjured up for the occasion; viz. $Cr O_4$, $Cr O_7$, and $Cr O_{10}$.

" 5. The binar theory requires us to regard not only phosphure-hydrogen and arsenure-hydrogen ($H_3 P$ and $H_3 As$) as tribasic acids, for $H_3 P$ with $3 Cu O$ forms $3 H O$ and $Cu_3 P$; but we must consider even ammonia $H_3 N$, which combines with several metallic oxides as $3 Hg O$, for example, to be metamorphosed into $3 H O$ and $Hg_3 H$; that is to three atoms of water + three atoms of red oxide of mercury associated with one atom of hydrogen !

" 6. The assumption that potassium, and the other alkaline and earthy metals, endued with the most intense affinity for oxygen, can unite with

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* We recommend Chemists, especially professors of the science, to bear Newton's first rule of philosophizing in mind: *Causas rerum naturalium non plures admitti debere, quam quæ* VERÆ *sint. Principia*, page 387. Londini. 4to, 1726.

† What would be said of a naturalist, who should simplify his arrangements, by clashing dogs and cats into one *genus animalium*, because they have both tails !

‡ *Handbuch*, vol. i., p. 474.

the salt bases SO_4, NO_6, &c., without abstracting the extra atom of oxygen from these compounds, has not even a shadow of probability.

"7. It has been hitherto deemed a distinction between the inorganic and organic acids, that the former have a simple radical, as chlorine, sulphur, &c., and the latter a compound, as carbon and hydrogen, or carbone and azote: but with the admission of the binar theory, that distinction is at an end.

"8. Arguments against this hypothesis, deduced from the laws of caloric, have been advanced by Hess (*Poggend.* 53, 499); and Persoz adduces several others in his *Chim. Molec.* 815. Undoubtedly, the partisans of this innovation have felt its embarrassments, since none of them have ventured to apply its provisions to chemical compounds in detail."

We here bid farewell, for the present, to Professor Gmelin, with many thanks for his *Handbuch*, distinguished no less by the copiousness than the fidelity of its facts, by the perfect fairness with which he treats all his predecessors and contemporaries, and by the free spirit of enlightened criticism which pervades the doctrinal discussions. We wish him health and strength to finish the collection and arrangement of the magnificent gallery of chemical science, of which he has so auspiciously completed the first compartment. Indeed, the first and second fasciculi of the second volume are already published, containing kalium, natrium, lithium, baryum, strontium, and calcium, with their primary inorganic compounds. It is quite equal in interest to the preceding portion of the book.

TRAITÉ DE CHIMIE, *Appliquée aux Arts. Par* M. DUMAS.

THE sixth volume of this valuable work has just been published, and early application should be made for it by those who are already in possession of the previous volumes. The work was commenced in the year 1828. It is a treatise on the general science of Chemistry; but distinguished from other works on that subject by containing a detailed account of the Chemistry of Arts and Manufactures.

It would be useless for us to enter critically into the merits of this work: by those who possess it, its value is, doubtless, appreciated, and it is placed pretty much beyond the reach of others, as the first five volumes are out of print, and can with difficulty be procured at two or three times the original price.

The present volume is the second on Organic Chemistry. It treats of the different species of vegetable tissue—the methods of bleaching these—the manufacture of paper, fæcula, and sugars—of fermentations—of the different kinds of fatty matter, and the manufacture of soaps.

Considerable delay has taken place in the publication of this volume, the previous one having appeared in the year 1835; but this is said to have arisen from the many important discoveries and improvements which have been taking place during the last ten years in the department of chemical science treated of, and which the author found it necessary to include in his work.

NOAD'S LECTURES ON CHEMISTRY.

[We have received the following letter from Mr. Noad, who feels aggrieved at a recent review of his work in another periodical. As Mr. Noad has been engaged in lecturing to the Members and Associates of the Society at Bath, he is anxious for his justification to appear in this Journal, which request we have thought it right to comply with.—Ed.]

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Road, 15th July, 1843.

Dear Sir,—I shall feel much obliged by your permission to make your Journal the medium through which to offer a few remarks on the review of my *Lectures on Chemistry*, which appeared in the *London and Edinburgh Philosophical Magazine* of last month. I may remark, in the first place, that in stating that Dr. Wollaston died in the fifty-third year of his age, I followed Professor Brande, who, in the fourth edition of his Manual, says, "Dr. Wollaston died in December, 1828, in the *fifty-third year* of his age." On referring to the *Encyclopædia Britannica*, I find it to be a mistake, the learned Doctor having been born on August the 6th, 1766, and died December the 22d, 1828; he was consequently in the sixty-third year of his age. I am blamed for not having alluded to the labours of the late lamented Dr. Henry. Now, Sir, though nobody can be more alive than myself to the important services rendered to science by this gentleman, if I had given an account of his contributions to Chemistry, I could not well have omitted to notice the works of some of his distinguished contemporaries, which would have encroached too much on my limited space.

I now proceed to notice the remarks on the chapter on *Oxygen*, which the reviewer states to contain several statements which require correction. The first objectionable passage is this: "Every human being on the face of the earth consumes nearly twenty-five cubic feet of oxygen every twenty-four hours (45,000 cubic inches daily, according to Lavoisier, Seguin, and Davy); and 112lbs. of charcoal require for combustion thirty-two cubic feet." On this it is observed, "We shall not object to the statement that twenty-five cubic feet of oxygen are consumed in twenty-four hours by every adult, but we may observe, that this quantity is equivalent to 43,200, instead of 45,000 cubic inches."

I believe that no person, on reading the sentence in my book, would be led to suppose that it was intended to make such an assertion as is here implied: the circumstance of the words, "45,000 cubic inches, according to Lavoisier," &c., being put in a *parenthesis*, is surely sufficient to show that the 45,000 cubic inches have nothing to do with the twenty-five cubic-feet, but refer to another calculation by Lavoisier, Seguin, and Davy. The latter part of the quotation, "112lbs. of charcoal require for combustion thirty-two cubic feet of oxygen," is a *typographical* error, which was detected after it was too late to make the correction, the 1lb. having been mistaken by the printer for 112lbs.

I am next found fault with for saying, that four gallons of oxygen gas is the maximum quantity obtainable from one pound of peroxide of manganese of *good quality*, and the reviewer has been at the pains to calculate the quantity which ought theoretically to be obtained from 7000 grains or one pound avoirdupois of *absolutely pure* peroxide, and which he finds to be $8\frac{8}{10}$ gallons. Now in my work, page 143, nothing is said about peroxide of manganese of "good quality," the passage being this, "We are here supposing the peroxide to be pure, which it never is, as met with in commerce; we may consider four gallons of gas from one pound to be ABOUT the maximum obtainable quantity," on what principle I should like to know does the reviewer assume to himself the right to insert the words "good quality" and to omit the word "about!" Let us, however, see what Dr. Kane (one of the

Editors of the *Philosophical Magazine*) says himself on the subject, in his *Elements of Chemistry*. In page 394, I find the following sentence, "Hence one pound troy is capable of furnishing seven imperial gallons of gas. The oxide of manganese found in commerce is not however pure; in general it does not contain more than sixty-five per cent. of pure oxide, and hence the quantity of oxygen furnished by a pound of it is *about two-thirds only of that just stated*," that is $\frac{2}{3}$ of seven gallons $= 4\frac{2}{3}$ gallons; or, in other words, *about four gallons*, as I stated.

My next mistake consists in stating, that the 1438 grains of oxide, left after heating 1638 grains of peroxide of manganese, is "a *mixture* of 992 grains of deutoxide and 446 grains of peroxide of manganese." Let me now turn to another high chemical authority. In Professor Graham's *Elements of Chemistry*, page 244, the following passage occurs: "Three equivalents (1638 parts) lose two equivalents of oxygen (200 parts) and leave a *compound* of one of deutoxide and one of protoxide." In this case, then, I merely employ the word "*mixture*" instead of the word "*compound*:" this is actually the full extent of my mistake ! ! !

I now come to the master-piece of the whole review:—"We are informed (says the reviewer) that half an ounce of chlorate of potash (218.75 grains) should yield 270 cubic inches of oxygen gas, he having just before stated that 1532 grains yield 600 grains of oxygen, 218.75 therefore give 857 grains, measuring 249 instead of 270 cubic inches." Let me first quote the passage as it actually stands in page 144 of my book: "1532 grains of chlorate of potash yield 600 grains of oxygen gas and 932 grains of chloride of potassium, *practically* half an ounce of chlorate of potash should yield 270 cubic inches or nearly a gallon of pure oxygen gas." Professor Graham states in his work, page 247: "*Half an ounce* of chlorate of potash should yield 270 cubic inches or nearly a gallon of pure oxygen gas. Dr. Kane says in his *Elements of Chemistry*, page 396, "Hence 100 parts of chlorate of potash give 39 of oxygen by weight, or *an ounce troy* 187 *grains or* 543 *cubic inches*:" —now if an ounce will furnish 543 cubic inches, it will be admitted, I presume, that half an ounce should yield $271\frac{1}{2}$ cubic inches, or *practically* 270 cubic inches, as I state in my book.

I will not occupy your space by any remarks on the evident *desire* to find fault, which is evinced by the foregoing quotation; but will briefly allude to the only two other "errors" which have been selected for animadversion:—*Note*, p. 144, "I find that the best chlorate of potash yields from ninety-six to ninety-eight per cent. of pure oxygen." "For some time," says the reviewer, "we were puzzled to attach any meaning to this statement, but at length we concluded, that the following is what the author meant:"—"I find that 100 grains of the best chlorate of potash yields from ninety-six to ninety-eight cubic inches of pure oxygen gas." Any person whose understanding had not been *intentionally* dulled, would have understood the meaning to be this, "the gas from chlorate of potash is not *absolutely* pure; it contains from ninety-six to ninety-eight per cent. of real oxygen gas." I here allude to the best chlorate of potash that can be obtained in shops, when the salt was very carefully prepared and the gas obtained with the greatest attention, Gay Lussac could only detect an impurity amounting to four volumes in 1000.

Lastly, It was thought worth while to animadvert on this passage, "from an equivalent of oxide of mercury we get 100 grains, or nearly 300 cubic inches of oxygen gas, and 1266 grains of mercury are found in the receiver," —"it should have been stated," observes the reviewer, "that from 1366 grains, *which may be considered as representing an equivalent*," &c., and the passage is quoted as exhibiting "an extraordinary degree of confusion," though with what justice others must determine.

Such, Sir, are the errors which oblige the Editors of the *Philosophical Magazine* "to withhold their approbation" from my *Lectures on Chemistry*.

I remain, dear Sir, yours faithfully, HENRY M. NOAD.

Obituary.—On Sunday, July 15th, aged eighty-eight, Dr. Hahnemann, the Inventor of the Homœopathic Theory.

TRIAL.

PATENT RICE STARCH.—Jones & Co. *v.* Berger.

This was a case which was decided in the Court of Common Pleas on the 12th of July, respecting a patent taken out by the plaintiffs for making rice starch by means of caustic alkali; and which it was contended was infringed by the defendant, who had taken out another patent for making rice starch by a combined process of fermentation and the use of carbonate of soda. The verdict was for the defendant.

We intend to give further particulars in our next number, thinking that some of the scientific details may be interesting to our readers.

TO CORRESPONDENTS.

"Fixateur."—The composition used for fixing ladies' hair, and termed *Fixateur*, *Crysphitique*, or *Bandoline*, is a mucilage of tragacanth, quince seed, or Irish moss. The last is generally preferred, being less liable to spoil and less expensive than the quince.

"Inquisitor," and I. W. W., enquire how to make show colours for shop windows. *Yellow:* A solution of bichromate of potash in water forms yellow or orange, according to the strength of the solution. *Blue:* A solution of sulphate of copper in water with ammonia. *Green:* Solution of sulphate of copper in water with chloride of sodium. *Red:* Cochineal, or red cabbage, with an acid. *Pink:* An ammoniacal solution of the oxide of cobalt. *Purple:* A mixture of the *pink* and *blue.*

We cannot suggest any deviation from the Pharmacopœia formula for Syrupus Limonis. Essence of rennett is quite out of our province.

X. L.—The action of acetate of morphia differs, according to most authorities, from that of opium; we cannot therefore recommend the substitution of a solution of that salt for laudanum, although a solution containing six grains to the ounce is sometimes sold for that purpose. The acetate of morphia in solution is not liable to spoil by keeping, if excess of acid be present.

"Socius."—Liquor Ammoniæ is recommended as a test of the purity of Balsam of Copaiba. "If pure balsam be shaken with Liquor Ammoniæ, sp. gr. .965, it becomes clear and transparent in a few instants, not so when castor oil is present. (*Planche*, as quoted by *Dr. Pereira*). "Transparent; free of turpentine odour when heated: soluble in two parts of alcohol (sp. gr. .796) it dissolves a fourth of its weight of carbonate of magnesia with the aid of a gentle heat, and remains translucent."—(*Edinburgh Pharmacopœia*). The other question is stale.

Mr. Ballard.—Compound Extract of Colocynth should be kept both in the hard and soft state, as all pills containing it are more or less liable to lose their form unless proper attention be paid to the consistence of the mass.

"Tyro."—For polishing brass, rotten stone, moistened with spirit of wine or turpentine, may be used. This answers very well for cleaning scale-pans.

"A London Associate." See page 49.

"Avis."—The skins of birds are often preserved by means of arsenical soap, consisting of arsenic, pepper, camphor, and soft soap. The same compound may also be advantageously employed for preserving the skins of the smaller quadrupeds.

"Industria et Spes."—The names of candidates who pass the examinations of the Society, will be published in the Journal at the end of the year, or earlier, if the Council should direct.

J. H.—Associates who commence business on their own account must become members, if they continue their connection with the Society.

"Veritas."—The subject has not been overlooked by the Council: and we trust when the bye-laws are completed the objection will cease to exist.

C. N.—The Secretary of the Society registers the names of Associates who apply to him respecting situations.

"A Member" (Stratford-on-Avon).—We have received several other letters respecting competition and low prices, which we are obliged to defer. We should have taken up the subject this month, but are expecting to receive further statistical information respecting some of the details.

"℥j."—A Surgeon could not proceed against a Druggist for prescribing, but might lodge an information with the Apothecaries' Company. No case of this kind has occurred in which it has been necessary for the Pharmaceutical Society to interfere.

X. Y. Z.—Eighteen-pence. No apprentice can join the Society without passing an examination. See the notice inside the cover of Vol II., No. 2.

R. T. S. J. M.—See pages 49—55.

Mr. Rowland has sent us the following:—Aqueous Solution of Shellac. To three ounces of Shellac and one pint of water, add two ounces of Borax: boil until dissolved. This preparation is sometimes used to prepare wood for French polishing.

G. E. S.—Mr. Brande mentions an ink made with Sulphate of Indigo and Tanno Gallate of Iron, which would probably answer the purpose required.

A. P. S. (Manchester) wishes for a remedy to clear the voice. Square Catechu is sometimes chewed for this purpose.

F. R. S. wishes for a recipe for "Granulated Cold Cream," which we think it probable some of our readers may be able to furnish. The examinations of the Pharmaceutical Society are held on the third Tuesday in each month. The diplomas are almost ready for distribution.

J. R.—See Vol II., page 530.

F. R. — 1. Chemists do not generally admit the existence of a bicarbonate of magnesia, although it is thought by some that such a compound is contained in the fluid magnesia prepared by Dinneford and by Murray. Professor Graham says, "The fact that this salt (Carbonate of Magnesia) dissolves in carbonic acid water, is not to be held as proof of the existence of a bicarbonate of magnesia."—2. We are not acquainted with the Cobourg Powders.—3. For the tests for nitrate of silver, see notes to the Pharmacopœia.—4. When *Spiritus Ammoniæ Succinatus* is ordered in a prescription, we should consider it correct to use the article ordered under that name in the former edition of the Pharmacopœia.

T. H.—1. For the method of preparing Extract of Indian Hemp, see page 80. —2. Iodide of copper may be made from iodide of iron and sulphate of copper.

A. P. S. (Stockport). The flocculent deposit which is sometimes met with in long-kept distilled water, arises from some impurity in the water.

J. O. P. (Nottingham). No edition of Thomson's *London Dispensatory* has been published since 1836. A new edition is expected shortly.

R. E. M.—The disappearance of the lump of Camphor kept in the Camphor mixture must arise either from the solution not being completely saturated when first made; or, from evaporation. The decomposition which some of the distilled waters undergo, is a subject for investigation. See Vol. I., page 344, of this Journal.

T. J. B. (Beverley).—Rouge for cleaning plate is made by calcining and subsequently levigating the precipitated peroxide of iron. It has been stated that the best rouge contains a small portion of the iron in the state of magnetic oxide. We are not acquainted with the recipe for making "composition varnish for patent leather;" but believe that a solution of gum benzoin or asphaltum in pyroxylic spirit, coloured with lamp-black, is sometimes used.

"Unus e Nobis."—In making the Pilula Ferri Composita, the effervescence which takes place on mixing the carbonate of soda and sulphate of iron with the treacle, arises partly from the presence of a portion of sulphate of *peroxide* of iron with which the protosulphate of commeree is always contaminated, and partly from the absorption of atmospheric oxygen, which converts a further portion of the protoxide into peroxide, in which state it is not supposed to combine with carbonic acid. Hence a portion of the carbonic acid is liberated, and this effect always takes place on mixing the salts above named, in a state of solution and exposed to the action of the air; nor is it increased by the application of some degree of heat. In the process described in our last number, page 35, the employment of heat is decidedly beneficial; it causes the expulsion of much of the air held in solution by the treacle, and therefore prevents the oxidizing influence of this; it promotes the decomposition and recombination of the constituents; and by increasing the fluidity of the ingredients, facilitates the extrication of the free carbonic acid, which would otherwise give the mass a spongy character, and render it on this account more exposed to the decomposing agency of the air.

The method described by our correspondent, of keeping the dry ingredients of this pill, merely mixed, in a state of powder, and forming this into a mass *with water*, when required in dispensing, is decidedly objectionable. The treacle, thus omitted, is an important item in the formula.

A. B.—The essential oil of hops is obtained by distillation. See page 94.

A. P. S. (Spalding).—Castor oil is generally purified by filtration.

John Earland.—We do not agree in the opinion that, "it is an error to supply the compound decoction of aloes *bright*." When first made the decoction is clear, and we think it is intended to be used in this state. If it be kept until a deposit has taken place to any considerable extent, it ceases to be what the college orders. In the general directions of the Pharmacopœia, with regard to decoctions, it is stated that these preparations are liable to undergo decomposition, and therefore should not be kept long, a remark which applies in a degree to this as well as to other decoctions. The nature of the deposit which occurs in this and some other cases, is a subject which deserves further investigation.

A. P. S. (Yeovil) is referred to Vol. II., page 3.

"Panque" is advised to buy varnish for gold labels of the varnish-makers, instead of trying to make it himself.

H. R., A. P. S.—1. An Associate who joined the Society before July 1st, 1842, may, if he thinks proper, pass the major examination when he becomes a Member.—2. The endless variety which is to be found in the peculiarities of plants cannot be accounted for.—3. Certainly not.

"Cannabis."—See *Medical and Surgical Journal*, April, 1841.

"Φ."—See Vol. II., page 732.

We have received communications from Dr. Lynch—"A Member" (Manchester)—"Ajax,"—"Ginger,"—and "Amicus," which we are obliged to defer.

Errata.—Page 29, line 37, "two equivalents of potassium," *read* "two equivalents of cyanide of potassium."

Advertisements to Mr. Churchill, Princes Street, Soho.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. III.—SEPTEMBER 1st, 1843.

COMPETITION IN THE DRUG TRADE.

The remarks which we made in a former number,* on the influence of excessive competition and low prices, are no less applicable to the retail than to the wholesale trade; and many of our correspondents have called upon us to pursue the subject still further, furnishing us, at the same time, with facts illustrating the evils of the system which is too prevalent.

We have already stated, on the authority of Adam Smith, that the price of a thing, in most cases, consists of three distinct elements—wages, labour, and rent; and that "the skill and dexterity required by some species of labour gives an additional value to its produce, which is no more than a reasonable compensation for the time and labour which must be spent in acquiring them." Consequently, the retail Druggist, in calculating the cost of his stock, and the profit to which he is entitled, should take into consideration the rent and other necessary expenses of his establishment, the skill and experience which he has acquired by constant application, and the labour of selecting and preparing his commodities for the use of the consumer. He is entitled to a larger share of profit, in the sale of simple drugs, than the Grocer, Oilman, or Chandler could command, in direct proportion to his superior education and practical knowledge of the nature and properties of the substances which it is his peculiar province to prepare and sell, but which they occasionally offer to their customers as an extraneous branch of their business. The Apothecary is entitled to a larger profit than the Chemist, because his charge for medicines includes remunera-

* Vol. ii., page 557.

tion for professional attendance; and the fee which the Physician receives, for his advice only, is greater than that which is awarded to the Apothecary for both advice and medicines, because the Physician is obliged to undergo a more expensive course of education, and to pass a more severe examination, and is consequently supposed to be more highly qualified, and entitled to greater confidence.

Again: an hospital Surgeon of the highest eminence is entitled to a much higher scale of remuneration for the performance of a surgical operation, than the Surgeon-Apothecary — in proportion to the superiority of his skill in a department to which he devotes his almost exclusive attention; and, in like manner, an operative Chemist of the first rank may fairly make a higher charge for an analysis, or any other chemical operation, than could be made by a person of inferior education and abilities.

The enormous profit which is realized by the sale of quack medicines, may be attributed to the value which the public put upon skill and knowledge (whether real or imaginary); since the mystery which is kept up, and the marvellous cures enumerated on the printed bills, induce a belief, on the part of the uninitiated, that the promulgators of these wonderful nostrums are men of superior intellect and sagacity—the sum and substance of which is condensed into a small packet of infallible medicine. Hence a patient will readily pay at the rate of almost a penny a grain for true James's powder, the original cost of which is probably about a penny an ounce — the faith which he has in the remedy, and his desire to obtain relief, overcoming every other consideration.

In all these cases, the knowledge and skill which the parties are supposed to possess, create in the public mind a corresponding amount of confidence, which gives a superior value to the commodities they sell, or the services they perform.

But in order to sustain this confidence, moral integrity is no less indispensable than professional skill, and there is no class of avocations in which this is more essential than it is in those which relate to the public health. In the sale of medicines, the most

serious result may be involved in the purity of a remedy and the accuracy of its preparation; and, consequently, no person would knowingly place his life in the hands of another who could be supposed capable of betraying the trust, either from negligence or mercenary motives.

The character for honesty and fair dealing is easily attainable, since it is inherent in every person until he has forfeited it by dishonest conduct; but professional skill must be acquired by dint of labour and study, the result of which must be brought into public notice before any degree of reputation can be established.

Applying these general remarks to the particular case under consideration, it is evident that the Chemist and Druggist cannot expect to enjoy a fair and adequate remuneration for his labour, unless he possess the confidence of the public, both as to his integrity and competency. The converse is equally true, that if he possess these qualifications he ought to enjoy the remuneration, and must of necessity enjoy it, unless the system which he pursues be defective.

From the facts with which we are conversant, and numerous statements which we have received from all quarters, both in the metropolis and in other parts of the country, we have no hesitation in saying, that a majority of our brethren are not adequately paid for their labour—that the prices at which drugs are sold, whether in the simple or compounded state, are, in many cases, such as to preclude the possibility of supplying those of the first quality—and that the result of this excessive competition is alike ruinous to the trade and injurious to the public.

In country towns, and, indeed, in most places excepting London, the evil appears to arise, in a great degree, from the invasions of Grocers, Oilmen. and other unqualified persons with whom the Druggist ought not to be placed in competition.

The business of a Grocer is simply a trade. The articles comprised in the term *grocery* are not numerous, and their quality is estimated by their external or physical characters, a knowledge

of which is easily acquired. The public being as competent to judge of these matters as the Grocer himself, no responsibility rests on him but that of pleasing the eye and the taste of his customers. His returns being large, and his capital frequently turned over, a moderate per centage of profit on each transaction produces a remunerating income.

The business of a Chemist and Druggist is a link between a trade and a profession. He must (if qualified) have a liberal and scientific education. His stock comprises a very long list of substances, many of which undergo tedious and expensive processes in the course of their preparation: his returns are so small, especially those which are derived from dispensing prescriptions, that unless his profit were much larger than that of the Grocer, he could not even pay the expenses of his establishment. In dispensing prescriptions, his time and labour must be considered a part of his "stock in trade;" and any calculation of profit in which these items are not taken into consideration, is fallacious. The average price which should be charged for a mixture or box of pills, cannot be estimated by calculating the price per pound or per hundred weight of the several ingredients, but must include a fair amount of remuneration for the manipulations required, and the labour of acquiring the needful dexterity. Even in the retail department, the *qualified* Chemist is entitled to receive a compensation for his skill and experience in selecting or purifying the articles for the good quality of which he is responsible; and since his customers are unable to test the purity of drugs, and consequently obliged to trust to his superior judgment, they are in general, when the facts of the case are understood, quite willing to pay the extra price which in fairness he demands.

But when the Grocer invades the province of the Druggist, he does so in his capacity as a Grocer, without any pretensions to a scientific acquaintance with the properties of drugs. In regulating his charges he allows himself the same proportion of profit which he finds to answer his purpose in the sale of grocery, or in some cases even less, hoping to increase the number of his

customers for other goods by contrasting his charge for drugs with those of the regular Druggist. On the same principle he sells sugar at little or no profit, as an inducement to his customers to buy tea, which makes up the deficiency. This is called "baiting with a sprat to catch a herring." In the case of tea and sugar, the practice affects no one but himself; but in the other case, the interest of the Druggist is injured, the Grocer gains but little direct advantage, and the result of this unnatural competition is, that medicines of a very inferior quality are too often supplied to the public by both classes.

Similar observations apply to the sale of drugs by Oilmen, Chandlers, and general dealers, who cannot be expected to pay much attention to the quality of articles, of the properties of which they know very little.

The indiscriminate sale of drugs by unqualified persons would produce much less injury to the credit and interests of the regular Druggists, if the public had the means of forming a correct estimate of the value of the articles they purchase, and of the qualifications of the parties concerned. But unfortunately in most country towns not only is every Grocer and Oilman a Druggist, but almost every Druggist is a Grocer and Oilman. The Druggist has no badge or credentials to designate his superior qualification; in fact, he is not *of necessity* more qualified than the Grocer. The blue and red bottles in the windows are common to all; and this is the criterion understood by the public as indicating what is called "a doctor's shop."

So long as the Chemists and Druggists continue to occupy this anomalous and equivocal position, they cannot expect to enjoy either the rank or the emolument which ought to belong to their avocation. It is true, that the exercise of their functions requires a liberal and scientific education, as well as practical experience—it is true, that many of them possess these requisites; but it is equally true that others, who call themselves Chemists, are no more entitled to public confidence than those parties whom they denounce as unqualified. This, then, is one of the chief sources of

the evil—namely, that those who have subjected themselves to the labour and expense of a proper education, are deprived of the rank which they ought to enjoy in the public estimation, because they are not sufficiently distinguished from the illiterate.

The ancient Apothecaries were in a similar predicament. They were not distinguished from the Grocers until the year 1617, when a separation took place, and 117 of their number were constituted by Royal Charter a distinct body. A qualification was established, which in course of time was sanctioned by Act of Parliament, and thus the line of separation between Apothecaries and Grocers became so complete, that the circumstance of their ever having been united is looked upon as a curious historical fact.

Reverting to the Chemists and Grocers of the present day, we may observe that a similar course of events is in progress. The Chemists are now recognized as a distinct corporate body, all future admissions into which, must be founded upon the possession of a proper qualification in PHARMACY, and hence will arise that distinction by which the regularly educated Chemist may be recognized by the public, and on account of which he may expect to be better appreciated and rewarded than he is at present.

In the metropolis a complete line of demarcation is observed between the Chemists, Grocers, and Oilmen; but our brethren in the country must not imagine that on this account we are free from the evils of unnatural competition. We intend to proceed with this part of the subject in our next number.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURES.

Dr. Pereira's last Lecture on the Polarization of Light is deferred, in order to make room for several articles which it was thought desirable to publish this month.

MR. FOWNES'S LECTURES ON ELECTRICITY.

Mr. Fownes delivered his second lecture on Electricity on Wednesday, the 26th of July.* In the early part of the lecture the subject of Galvanism was treated of, the different forms of apparatus employed for producing current electricity were described, and several experiments were performed with a powerful Grove's battery. The connexion of magnetism and electricity was also described, and illustrations of the production of magnetism by means of electricity, and of electricity by means of magnetism, were given by the galvanometer, the electro-magnet, and the magneto-electrical machine.

DR. A. T. THOMSON'S LECTURES ON BOTANY.

This course of Lectures terminated with an examination of the students, which took place on Wednesday morning, the 16th of August. The Professor having offered as a prize a copy of his well-known work on Materia Medica, seven candidates presented themselves as competitors. Besides the *viva voce* examination, a few printed questions were prepared, to be answered in writing. The answers were delivered to the Professor, each having a motto, the names of the candidates, with their respective mottoes, being sent, sealed, to the Secretary.

On Friday, the 25th, the students were summoned, and the prize was awarded to

Mr. Fowler, of 277, Oxford Street.

Certificates of merit were also given to

Mr. Philipe, of 12, Stanhope Terrace.

Mr. Hooper, of 22, Commercial Place, North Brixton.

* There is an error in our notice of Mr. Fownes's first lecture, contained in the last number of this Journal. It should have been stated to have occurred on the 28*th of June*, instead of the 26th of July

The following are the printed Questions:

1. What is the distinction between a root, a rhizome, a cormus, a tuber, end a bulb? Describe the characters of each. 12
2. What are the distinguishing features between Exogens, Endogens, and Acrogens? 12
3. Describe the various parts of the flower, and the uses of each part. 16
4. Name the plant of which the following is a description; and say to which of the Natural Orders it belongs:—

"The root woody; the stem shrubby, branched, twining, and rising, when supported, ten or twelve feet. The leaves smooth, acute, the lower ones ovate or cordate, the upper more or less perfectly hastate—all entire at the margin. The flowers, either opposite to the leaves or terminal, in drooping, alternately subdivided, cymose clusters; furnished with minute bracts. Flowers pale purple, with a five-parted calyx, and a rotate corolla, five times divided, each segment having two green dots at its base. The anthers five, converging into a cone, each opening by a pore at the apex. The fruit an oval, juicy, two-celled, scarlet berry, which is bitter and poisonous." 10

THE PHARMACEUTICAL MEETINGS.

These Meetings having been discontinued for a short time, in common with the meetings of other societies at this season of the year, will be resumed on the 11th of October. It is requested that scientific papers, specimens of new or improved products, chemical or Pharmaceutical apparatus, or any other contribution which might be calculated to be interesting to the Members of the Society, may be forwarded during the present month, or early in October.

It is to be hoped, that the spirit and energy with which these scientific meetings have been carried on from the time of their commencement, will not in any degree subside; but that the advantages to be derived from the periodical discussion of subjects connected with our profession, will be promoted by those who are qualified to furnish information, and appreciated by those who attend for the purpose of improvement.

PROVINCIAL SCHOOLS OF PHARMACY.

At an adjourned meeting of the Council, which was held on the 15th of August, the subject of education was maturely considered, and a discussion took place on the propriety of establishing Branch Schools of Pharmacy in those localities which might be in a position to support such institutions. The Council were unanimous in the opinion, that it is imperative upon the Pharmaceutical Society to introduce a more regular plan of education for students in Pharmacy than has hitherto existed in this country, and to extend the benefits of public instruction to all places in which it may be found practicable; at the same time it was thought expedient to proceed with some degree of

caution, and to establish schools in such towns only as could be expected, from their population and other advantages, to support them creditably. Applications having previously been received from Manchester, Bristol, and Norwich, for grants of money to assist in defraying the expenses of proposed Courses of Lectures, the Council resolved to open a correspondence with the Secretaries of those places, in order that their respective plans and arrangements might be laid before them at their next meeting, on the 6th of September.

REPORT FROM THE MANCHESTER SCHOOL.

In January last the Committee of the Manchester district having engaged the use of the lecture theatre of the Royal Medical School in Manchester, Mr. Davies, lecturer on Chemistry in the school, commenced a course of twelve lectures on Chemistry, one to be delivered weekly.

Forty-four tickets were sold, of which forty-three to Members and Associates of the Society were charged half-a-guinea each, and one non-member's ticket, charged one guinea. The attendance to these lectures averaged about thirty. Of the subscribers

Four	were from	Rochdale	Eleven miles	from Manchester
Two	"	Oldham	Eight	"
Three	"	Stockport	Six	"
One	"	Hyde	Eight	"
One	"	Bury	Nine	"
One	"	Bolton	Twelve	"

Thirty-two were from Manchester, Salford, and the neighbourhood.

Mr. Davies said that his audience was the most attentive one that he had ever addressed.

After the conclusion of Mr. Davies' lectures, Dr. Hardy, lecturer on Botany at the Manchester Medical School, commenced in May last a course of twelve lectures on General and Medical Botany. Thirty tickets were taken; twenty-eight by Members and Associates at 5*s.* each, two by non-members at one guinea each. The attendance at this course averaged about twenty. Twenty-two tickets were sold to residents in Manchester, and eight in the surrounding towns, viz. two in Stockport, two in Bury, one in Bolton, and one in Staleybridge. The fund derived from the admission fees, assisted by a grant of thirty guineas from the Council in London, has been sufficient to defray all the expenses incurred, leaving a small balance in hand.

LETTER FROM THE COLLEGE OF PHYSICIANS, PHILADELPHIA.

At a Meeting of the Council, on the 2d of August, a copy of the United States Pharmacopœia was received from the College of Physicians of Philadelphia, with the accompanying letter:

" Sir, " *Philadelphia, May* 8, 1843.

" The College of Physicians of Philadelphia, instituted and incorporated in 1789, by act of the General Assembly, to advance the science of Medicine, empowered its Library Committee to transmit six copies of the Pharmacopœia of the United States, to such individuals and corporate bodies as had greatly promoted the improvement of Pharmacy. The Committee, therefore, request you to accept, in the name of the College, of the copy

which accompanies this letter, for the Pharmaceutical Society of Great Britain.

"The Committee apologizes for delay. This has arisen from causes wholly without its own power, which was promptly exerted.

"We have the honour to be, Sir,

"With great respect and esteem,

"Your obedient Servants,

"S. Littell,

"Francis West,

"B. H. Coates, *Chairman. Committee on the Library.*"

"*To* Wm. Allen, *Esq., President of the Pharmaceutical Society of Great Britain.*

THE SALE OF SPIRITS OF WINE.

Several Druggists in Leicester having been informed against by officers of the Excise, for selling spirits of wine in quantities as small as an ounce and a half, a letter from Mr. Nettleship, on the subject, was discussed by a Committee of the Pharmaceutical Society, on the 22d of August.

The Committee being aware of the fact, that the whole subject connected with these prosecutions is now under the consideration of the Lords of the Treasury, together with a memorial from the Chemists and Druggists, the answer to which has not yet been received, concluded that they had not the power to interfere; but the subject was referred to the next meeting of the Council, which will be held on the 6th of September.

Although the Council have not lately had any report to make on this subject, it has repeatedly engaged their attention, not only at their meetings, but also in their individual capacity, and endeavours have been used to bring the question to a favourable issue with the Excise. It appears, however, to be involved in more difficulty than was at first imagined. The power possessed by the Treasury being absolute, and their decision in every case final, there is no other tribunal to which appeal could be made, unless it were thought advisable to petition Parliament, a course which the Council are not prepared at present to recommend.

DONATIONS TO THE LIBRARY.

		Presented by
The Lancet for the years 1839, 40, 41.		J. W. G. Gutch, Esq.
Memoirs of the Botanical Garden at Chelsea, by H. Field	1820	Dr. Merriman.
The Spanish Pharmacopœia	1823	Dr. Gorman (Spain)
The Pharmacopœia of the United States	1842	The College of Physicians, Philadelphia

		Presented by
Quincey's Lectures on Pharmacy, by Shaw	1723	Mr. Ince.
Arbuthnot on the Nature of Aliments	1731	
Tracts relating to Natural History	1762	
Knight on Catholicons	1749	
Maculloch on the Art of making Wine	1817	
The Art of Distillation	1664	
Febure's Traité de la Chimie	1669	
Field's Memoirs of the Botanical Garden at Chelsea	1820	
Field's Introductory Address to the Members of the Society of Apothecaries	1835	
Letter on Quackery	1839	
Bucknell on the Eccaleobion	1839	
Alexander's Experimental Essays	1768	
Tissot's Advice to the People on Health	1765	
Allen's Summary of the Practice of Physick	1761	
Bibliotheca Pharmaceutico-chemica, Herausgegeben, von Wilhelm Engelmann		Robert Brown, Esq., D.C.L. F.L.S.
Powell's Translation of the London Pharmacopœia	1809	Mr. Robert Bentley.
Brookes's General Dispensatory	1753	
The New British Dispensatory	1781	
Dossie's Institutes of Experimental Chemistry, 2 vols.	1759	Mr. G. W. Court (Regent Street)
Pharmacopœia Nosocomii Academiæ Londinensis	1828	
Falconer's Lectures on Anatomy and Surgery	1777	
Monro's Anatomy	1768	
Parkinson's Hospital Pupil	1800	
Hancock on British Guiana	1835	
——— on Cholera and Pestilence	1831	
Transactions of the Medico-Botanical Society, Part I.		
Duncan's Edinburgh New Dispensatory	1808	Mr. Spencer (Lamb'sConduit Street)
Quincy's English Dispensatory	1722	
Quincy's Medical Lexicon	1794	
Lavoisier's Chemistry, by Kerr	1796	
Henry's Chemistry, 9th edition, 2 vols.	1823	
Accum's Chemistry, 2d edition, 2 vols.	1807	
Venables's Practical Directions for the Preparation of Aërated Waters	1843	Mr. Knight (Foster Lane)

DONATIONS TO THE MUSEUM.

Mr. Keating, *St. Paul's Churchyard.*—Maranta Arundinacea, rhizome —Quillai Bark, from South America—Guatemala Balsam, from ditto.

Messrs. Godfrey and Cooke.—Tincture of Ambergris—Tincture of Russia Castor.

Mr. John Savory.—Specimen of Malden Salt.

Mr. R. M. Mills, *Bourn.*—Specimen of Mucic Acid.

Mr. Spencer, Jun.—Asparagus Plant.

Messrs. Baiss, Brothers, & Co.—Specimen of White Elemi.

Mr. Hulse.—Entire leaf of Cassia obovata from St. Vincent's—Fruit of the Dome Palm, from Upper Egypt.

Mr. Butler, *St. Paul's Churchyard.*—Substitute for Isinglass, from New York.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY RICHARD PHILLIPS, F.R.S., &c.
Honorary Member of the Pharmaceutical Society.

The preparation which I next examined, and as yet only one specimen has been submitted to trial, is Potassæ Hydras. This presented itself to my observation rather accidentally, owing to my requiring a supply of potash for the completion of some investigations in which I was engaged.

I sent to a Chemist a written order for ℥ss. Potassæ Hydratis; and I received from him a vial, labelled *Potassæ Hydriodas*, and containing what appeared certainly to be well-formed crystals of *Iodide of Potassium*. These I intend to examine on a future occasion. Suspecting that this mistake occurred in consequence of writing *hydras* in the genitive case, I again sent to the same Chemist for hydrate of potash, but determining to throw no obstacle in the way so as to prevent his understanding what was really wanted, I wrote for ℥ss. *Potassæ Hydras*, and this I actually received, or at any rate I obtained a substance intended for it, and it was labelled Potass*æ* Fus*a*. My suspicion of the cause of the mistake, in the first instance, was thus fully confirmed. Having this preparation in my possession, I thought I might as well examine it; though I confess, after what I have stated, as to the impurity of carbonate of potash, from which it is prepared, I could hardly hope that its purity would be great. In the first place, the cylinders were of a dirty brown colour, and of a very rough and cracked surface. In order to examine the state of its purity, the following experiments were performed:— 105 grains were submitted for a short time to red heat, in a platina crucible, by which they lost 13 grains, amounting to 12.3 per cent.; 150 grains were put into distilled water, and there remained insoluble in it about six grains, which, from the colour, evidently consisted for the most part, if not entirely, of sesquioxide of iron; to the solution, after it had become clear by subsidence, sufficient water was added to make it up 20 fluidounces; of these eight fluidounces were saturated with nitric acid, and gave, on the addition of solution of nitrate of silver, 1.7 of chloride of silver; the whole quantity would, therefore, have yielded 4.25 grains of chloride, denoting 1.06 of chlorine, probably in combination with potassium, and if so, indicating about 1.5 per cent. of this salt. This, therefore, on account of the smallness of its quantity, is an unimportant admixture; six

ounces of the solution, also after saturation with nitric acid, gave, on the addition of chloride of barium, 8.1 grains of sulphate of barytes, equivalent to 27 grains of sulphate, for the whole quantity; and indicating the presence of very nearly 14 per cent. of sulphate of potash in the hydrate of potash; lastly, to four ounces of the solution of 150 grains of the potash in 20 of water, lime-water was added in excess, the precipitated carbonate of lime collected, washed, and dried, weighed eight grains, equal to 40 grains, for the 150 of potash, or 26.6 per cent., and indicating 37.2 per cent of carbonate of potash.

Estimating the whole of this compound to be pure hydrate of potash, which has not been shown to be actual impurity, it will appear that it consisted of, very nearly,

	Water	12.3
	Sesquioxide of Iron	4.0
	Chloride of Potassium	1.5
	Sulphate of Potash	14.0
	Carbonate of Potash	37.2
leaving for	Hydrate of Potash	31.0
		100.

Of this preparation, therefore, nearly 70 per cent. was impurity.

To ascertain whether any other Chemists would mistake *hydratis* for *hydriodatis*, I sent to three parties directions for gr. xl. potassæ hydratis to be dissolved in 2 oz. of water. From one of them I received a solution which was pretty clear, alkaline to turmeric paper, contained only a little peroxide of iron, rather small quantities of carbonic acid, common salt and sulphate of potash; in this case, therefore, it was evident that my directions had been understood.

The second solution was also alkaline to turmeric paper, and had evidently been prepared with hydrate of potash of about the same quality as that of which the analysis is given above; it contained much carbonate and sulphate of potash and chloride of potassium; on standing it deposited much sesquioxide of iron; for the presence of this last substance, the Chemist accounted by saying, *that the potash was decomposed during the operation of the heat.*

The third solution was not alkaline to turmeric paper, and thus finding that it had no alkaline reaction, I added a portion of it to a solution of bichloride of mercury, when I immediately obtained the well-known bright red coloured precipitate, which indicates the presence of biniodide of mercury. This Chemist then, like him already mentioned, read hydriodatis, instead of hydratis, and I consequently obtained a solution of iodide of potassium, instead of hydrate of potash.

I next submitted distilled water, though obtained only from two

Chemists to examination; this as is well known, should not be rendered turbid, or give any precipitate with oxalic acid or oxalate of ammonia, lime water, nitrate of silver, or chloride of barium.

Distilled Water, No. 1.—This was very nearly pure; it contained neither sulphates nor salt of lime, and gave by nitrate of silver only very slight indications of the presence of chlorine, so little indeed, that it might have been derived from the water having been kept in a stone-ware instead of a glass bottle; the glaze of this ware being common salt, a slight portion is dissolved by the water, but sufficient to give indications of its presence by the action of nitrate of silver.

Distilled Water, No. 2.—This, like the last, contained neither any sulphate, nor calcareous salt, and only a trace of chlorine, but it had a smell of vegetable matter, and when a little nitrate of silver was added to it, it became red by exposure to the light for some hours; this appearance is well known to be produced by the action of vegetable matter on the salts of silver; some water which had been distilled from a still used entirely for this purpose, underwent no similar change when treated in the same manner. Under these circumstances, I have no doubt that the still from which the specimen of water I examined had been distilled, had just previously been used for preparing some aromatic water; and it cannot be too strongly impressed on the Chemist, that a still should be reserved for water only.

I may here remark, it has been supposed that the precipitation which takes place when solution of diacetate of lead is added to distilled water, is always derived from the presence of carbonic acid in the water; and, although it is undoubtedly capable of producing this effect, yet I found that water freshly distilled, and employed before it had any opportunity of acquiring carbonic acid, decomposed the solution of lead.

Argenti Nitras.—This preparation is sometimes carelessly and also fraudulently prepared; as far, however, as my examinations have yet extended, I have not met with an instance of either. The method by which I have tried various samples is simple; it is that of adding an equivalent of hydrochlorate of ammonia to one of the salt in question, and finding whether there was any notable proportion of the hydrochlorate in excess after precipitation; this will prove that there was no nitrate of potash in the nitrate of silver, and the absence of nitrate of mercury is indicated by determining the total solubility in ammonia, of the chloride precipitated by the hydrochlorate of ammonia.

I have examined several samples of this salt:—

No. 1. Colour greyish, fracture crystalline, somewhat translucent. To 58 grains dissolved in water was added a solution of 18.4 grains of hydrochlorate of ammonia; on sepa-

rating the chloride of silver by the filter, and on the addition of nitrate of silver to the solution, scarcely any precipitation took place, and the chloride being entirely soluble in ammonia, it is evident that silver was the only metal present, and that it was as nearly in the requisite quantity as could reasonably be expected.

Argenti Nitras, No. 2.—Nearly colourless, crystalline and translucent. To a solution of 37 grains, was added a solution of 11.7 grains of hydrochlorate of ammonia. There was scarcely any excess of the hydrochlorate, and the chloride precipitated, was entirely soluble in ammonia. This preparation had, therefore, been properly made.

I tried two more samples with results nearly as above stated, and it is therefore evident that less adulteration has been practised with this preparation than is generally imagined. I shall, however, on a future occasion, probably extend my inquiries respecting it.

Æther Sulphuricus.—After what I have already stated as to the Spiritus Ætheris Nitrici, it can hardly be expected that this preparation would occur of good quality; as yet I have examined only four specimens, the properties of which were as follows:—

No. 1.—Slightly coloured. Not acid to litmus paper. Specific gravity 0.760.

No. 2.—Colourless. Not acid to litmus paper. Specific gravity 0.746.

No. 3.—Colourless. Not acid to litmus paper. Specific gravity 0.832.

No. 4.—Colourless. Very acid to litmus paper. Effervesced with carbonate of soda. Specific gravity 0.869

This preparation is directed by the London College to be of sp. gr. 0.750; No. 1 was therefore a little too dense, and No. 2 even lighter than directed. No. 3 was very little lighter than rectified spirit, and of this, with a little ether, it evidently consisted; while No. 4 was much denser than rectified spirit, and it must have been composed of a little ether, more spirit, and much water. I intend, hereafter, to examine some more specimens of this preparation.

ON THE PREPARATION OF HYDRIODIC ACID.

In consequence of a remark made at a recent meeting of the Pharmaceutical Society, recommending the use of hydriodic acid in the manufacture of iodide of potassium, we have been applied to by two or three correspondents, for a description of the best and easiest method by which this acid can be obtained. A correspondent, who writes from Birmingham, seems to consider the process an intricate and difficult one; but in this opinion

we do not coincide, at least with reference to the liquid acid, which of course would be used in the case alluded to. The process recommended in most chemical books, consists in mixing iodine with water, placed in any suitable vessel, and passing a stream of sulphuretted hydrogen through the liquid, until the whole of the iodine has disappeared. The sulphuretted hydrogen (H S) on coming in contact with the iodine, is decomposed, the hydrogen quitting the sulphur, which is precipitated, and combining with the iodine to form hydriodic acid (H I), which is held in solution. On heating the liquid to expel free sulphuretted hydrogen, and separating the sulphur by filtration, a colourless solution of pure hydriodic acid is obtained. There is, surely, nothing complicated in this process; it is a case of simple substitution.

In conducting the operation, there are two or three practical points to be attended to, on which the success and facility with which it is conducted will greatly depend. The iodine should be reduced to fine powder, by rubbing it down in a mortar, and in doing this, it will be well to add a small quantity of the water with which it is to be mixed. The iodine (half an ounce) and water (eight ounces) are now to be placed in an open vessel, such as a beaker glass, or a cylindrical pint measure-glass, and a glass rod of suitable size provided, for the purpose of agitating the mixture during the transmission of the gas through it.

It is necessary to have an abundant supply of the sulphuretted hydrogen gas, and the following is the best means of obtaining it:—In the first place provide a gas generating bottle; a six or eight ounce wide-mouthed bottle, to which is fitted a cork with a bent tube of sufficient length to reach the bottom of the vessel containing the iodine, will answer the purpose. Into this bottle put an ounce or two of sulphuret of iron, in pieces about the size of a pea. The best sulphuret of iron is made by heating a bar of iron at a blacksmith's forge, to a white or welding heat, and while the iron is at this temperature, holding a stick of roll sulphur against the end of it, over a pail of cold water. The sulphur and iron enter into combination, and the resulting sulphuret flows in a state of fusion into the water. This sulphuret is an indispensable item in every practical laboratory, and some of it, as above directed, should be kept in a gas-generating bottle, ready for use. On pouring a few ounces of diluted sulphuric acid into the bottle, a copious evolution of sulphuretted hydrogen takes place, which is to be conducted to the bottom of the vessel containing the iodine and water, by means of the bent tube. As the gas is thus made to pass through the mixture, the iodine should be stirred up with the glass rod from the bottom. Notwithstanding this precaution, however, it will be found

difficult to keep the iodine diffused through the liquor, for the sulphur, as it separates, forms a spongy mass, in which the iodine becomes enveloped, and shielded from the action of the gas. This constitutes a practical difficulty, and indeed the only one which occurs in the operation, as it becomes necessary to continue the transmission of the gas for a much longer time than would otherwise be the case.

It is very easy to obviate this difficulty, in making the hydriodic acid for the purpose we are contemplating, namely, the employment of it in the manufacture of iodide of potassium. Instead of mixing the iodine with the water, in which case the greater part of it remains undissolved, the four drachms of iodine should be mixed with six drachms of iodide of potassium, or a sufficient quantity of the solution of iodide of potassium under operation, so as to form a clear solution. On sending the sulphuretted hydrogen gas through this solution, the decomposition is effected in a very short time, and without the slightest difficulty, the acidification of the iodine being completed in about two minutes.

The completion of the process is ascertained by the entire discolouration of the liquid; and this being effected, the gas-delivering tube is to be removed, and the acid being poured away from the remaining sulphuret of iron contained in the bottle, the latter will be ready for use on a subsequent occasion. We now have a solution of hydriodic acid mixed with iodide of potassium; and this may be used for neutralizing the alkalinity of the iodide of potassium liquor; while any remaining portion, not required for this purpose, should be saturated with potash, and then added to the other liquor.

A CAUTION RESPECTING NITRIC ACID.

We not unfrequently see prescriptions in which five or six minims of nitric acid are ordered for a dose, diffused in an ounce or an ounce and a half of fluid. This is a strong dose when the acid is of sp. gr. 1.4, as was the case with the acid generally used until lately. But since the publication of the remarks of Mr. Phillips* on the subject, which drew attention to the fact that the acid ordered in the Pharmacopœia is of sp. gr. 1.504, the manufacturers have supplied the article according to the correct standard; and the circumstance not having been sufficiently made known in the medical profession, patients have sometimes suffered from the inconvenience of taking a dose considerably stronger than was intended. In such cases we conceive it to be

* Pharmaceutical Journal, vol. ii, p. 315.

the duty of the Pharmaceutical Chemist to impart that information to the prescriber which shall enable him to regulate the dose accordingly.

The maximum dose of acidum nitricum dilutum is stated in the Pharmacopœia to be forty minims (equal to four minims of the strong acid); and we have no hesitation in stating, that this quantity is quite sufficient, *unless largely diluted*, to act injuriously on the enamel of the teeth. On reference to some other authorities, we see the dose of strong nitric acid stated as "from five to ten minims;" and on this account might have felt a delicacy in animadverting on the subject, if we had not repeatedly heard serious complaints from patients. An instance lately occurred in which six minims were taken in an ounce of fluid, three times a day. In the course of two or three days, the teeth were found to be seriously injured, to the great annoyance of the medical attendant, who was not aware that he had ordered more than might be taken with perfect safety. In all cases in which it is desirable to administer large doses of this powerful acid, care should be taken to dilute it sufficiently, and the patient should be directed to rinse the mouth with water or a solution of carbonate of potash, immediately after having taken each dose. These precautions should never be neglected by those who consider the preservation of a good set of teeth of any importance.

We may also observe, that the strong nitric acid should never be used in dispensing in small quantities, as it is impossible to measure a few minims with so much accuracy as a proportionate quantity of the diluted acid.

Nitric acid of sp. gr. 1.504, always contains a considerable portion of nitrous acid, which gives it a pale yellow colour. The action of light and air occasions the liberation of oxygen, and the consequent conversion of a further portion of nitric into nitrous acid. According to M. Millon this is the case, more or less, with commercial nitric acid of all densities, but more particularly when highly concentrated; consequently, the Acidum Nitricum P. L. is not a convenient preparation for general use, and should be kept in the dark, and not unnecessarily exposed to the action of the air by the frequent removal of the stopper.

A Member (Dudley) has sent the following formulæ for publication:

INK POWDER.

℞ Ferri Sulphat. Calcinat, ℥xij.
Pulveris Gallarum, ℥iv.
Pulveris Acaciæ, ℥j.

Mix. One ounce will make a pint of ink.

WRIGHT'S PEARL OINTMENT.

℞ Hydrarg. Præcip. Alb. ℥viij.
Liq. Plumb. Diacet. Oj.
Ceræ Albæ, ℔vij.
Olei Olivæ, ℔xvi.

Rub the first two ingredients together in a mortar, liquefy the last two by a gentle heat, then add the former to the latter, stirring constantly until quite united.

FRENCH POLISH.

Take of Spirit of Wine or Naphtha, one pint.
Shellac, three ounces.
Gum Thus, half an ounce.

Dissolve with the heat of a sand-bath, then add
Oil of Sweet Almonds, two ounces.

We consider the following a better formula:

Orange Shellac, (not bruised) ℥xxii.
Rectified Spirit of Wine, Oiv.

Dissolve with a gentle heat.

FLUID EXTRACT OF SENNA.

(Communicated by Professor Christison.)

Take fifteen pounds *avoirdupois* of Tinnevelly senna, and exhaust it with boiling water by displacement: about four times its weight of water is sufficient. Concentrate the infusion *in vacuo* to ten pounds; dissolve in the product six pounds of treacle previously concentrated over the vapour-bath, till a little of it becomes nearly dry on cooling; add twenty-four fluid ounces of rectified spirit (dens. .835); and, if necessary, add water to make fifteen (16 oz.) pints—the object being that the preparation shall be of such strength that every *fluid* ounce shall correspond to one *avoirdupois* ounce of senna. Mr. Duncan, of Edinburgh, generally makes eighty pounds of senna into this extract in one operation. The numbers given are those by which he worked in the first instance. The dose is two drachms for an adult; it very rarely causes griping. It tastes precisely like treacle, and the absence of disagreeable taste is owing to the fact that pure senna has but a feeble mawkish taste, which treacle easily covers.

DR. PORTER'S SOLUTION.

LIQUOR MORPHII CITRATIS.

℞ Opii crudi Optimi, ℥iv.
Acidi Citrici (cryst.) ℥ij.
Semel in mortario lapideo contunde; dein
Aquæ destillatæ bullientis, Oj affunde,
et intime misceantur; macera per horas viginti quatuor; per chartam bibulosum cola.

MAGENDIE'S SUBSTITUTE FOR THE ABOVE.

℞ Morphiæ puræ, gr. xvj,
Acidi Citrici (cryst.) gr. viij.
Aquæ Destillatæ, f℥j.
ft. solutio. Colour with tincture of cochineal.

Dr. Porter's solution is about three times the strength of laudanum.

MILK OF ROSES.

℞ Amygdalarum Dulcium, ℔ss.
Aquæ Rosæ, Oiv.
Ceræ Albæ.
Saponis Albi (Windsor)
Olei Amygdalarum, ana ℥vj.
Spiritus Vini Rectificati, ℥xij.

Misce, secundum artem. Adde Olei Lavand. Rosæ, &c. &c., quant. suff. ad captandum.

ACIDULATED LEMON KALI.

℞ Sodæ Sesquicarbonatis.
Acidi Tartarici, ana ℔ss.
Sacchari Albi, ℔j.
Olei Limonis, gtt. 100,
Misce. s. a.

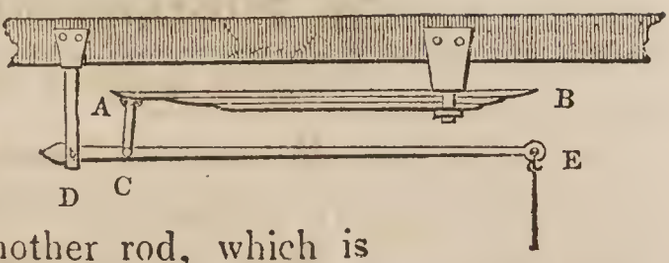
CERATUM COPAIBÆ.

Dr. Houlton informs us, that he has for many years employed a ceratum copaibæ, of which the following is a formula:

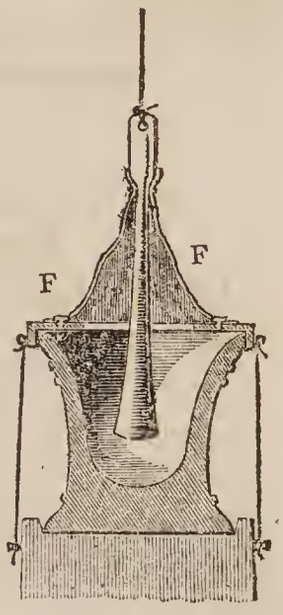
℞ Ceræ. Alb., ℥j.
Bals. Copaibæ, ℥ij.

First melt the wax, then remove it from the fire, add the balsam, and stir until cool.

THE SPRING PESTLE.



A B represents a common straight coach-spring, and *D E* a bar of iron attached to it by a short rod, *A C*, and moving on a pivot at the end of another rod, which is firmly fixed in a beam above it. The cord which supports the pestle is attached to the other extremity of the rod *E*.



F is a loose leather cover to the bell-metal or iron mortar, and is attached to the pestle by means of a groove near the top, to which it is tied. The lower part of this cover is fixed to the mortar by a ring, and being air-tight, or nearly so, it prevents the escape of any of the powder, without offering any obstruction to the free motion of the pestle.

This contrivance is a substitute for the horizontal pole, fifteen or twenty feet long, which is frequently used as a spring to raise the iron pestle. It is adopted by Mr. Deane of Clapham, who finds the power of the spring sufficient for the purpose. This might be increased, if necessary, by diminishing the length of the lever.

GRANULATED COLD CREAM.

(Communicated by Mr. Owen, of Dublin.)

White Wax,
Spermaceti, of each, 1 oz.,
Almond Oil, 3 oz.,
Otto of Rose as much as you please.

Let the wax and spermaceti be dissolved in the almond oil, and when a little cool, pour the mixture into a large Wedgwood mortar previously warmed, and containing about a pint of warm water. Stir briskly until the cream is well divided, add the otto, and suddenly pour the whole into a clean vessel containing eight or twelve pints of *cold water*. Separate the cream by straining through muslin, and shake out as much water as possible.

(The following was communicated by Mr. Turpin).

℞ Cetacei, ℥v.
Ceræ Albæ, ℥ij.
Adepis ppt., ℥iv.
Pot. Carb., gr. viij.
Aquæ Dist., ℥ij.
Sp. V. Rect., ℥vj.
Otto Rosæ.
Ol. Amygd. Ess. *ā ā.* q. s. M.

Dissolve the potash in the water, and add the spirit, melt the other ingredients in a water-bath, and drop in the scent, then put the former on a large dish; pour the latter on it, and chop the mixture with a knife till cold.

[We have tried both these formulæ. The first produces a result which is what it purports to be, "*granulated* cold cream." The second makes a whiter ointment with little if any appearance of granulation, which, on account of the potash contained in it, would be inapplicable to some of the cases in which cold cream is used, and we think it is not improved by the addition of the lard and spirit.—Ed.]

THE PROGRESS AND PROSPECTS OF THE PHARMACEUTICAL SOCIETY.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Liverpool, 24th July, 1843.

Sir,—Seeing that our Society has hitherto progressed so rapidly, and that it still has in view the consummation of a legal establishment by Act of Parliament, without which attainment, indeed, it cannot ultimately secure the benefits sought for, if at all it be perpetuated, would it not be advisable for a deputation from London to visit the principal towns in Great Britain, call meetings of the members and non-members (Druggists), with a view of bringing before those Druggists who have not yet joined us the advantages ultimately to be obtained, and the certainty of success if we are only united a little longer in the effort? Does not some step of this kind seem necessary from the many respectable Druggists who have not yet joined us?—many of them, I am sure, from knowing scarcely anything about the nature, objects, and progress of our Society; indeed, in some places, I have been surprised to find amongst respectable Druggists almost an utter ignorance of its existence. Again, the very few additions that we have had since the examinations have been instituted, seem to indicate that some effort of this kind is desirable, as our numbers ought to increase before we can hope to obtain the sanction of the Legislature.

I am, Sir, your obedient Servant,

A Member.

[Although the above letter is anonymous, we publish it because it contains sentiments which have frequently been expressed by other Members of the Society, and on which we think it right to make a few comments.

Every one who has considered the subject must be sensible of the advantage which an Act of Parliament would confer, not only on the PHARMACEUTICAL SOCIETY, but also on the public at large, by enforcing a certain amount of qualification on those who practise Pharmacy. It is obvious, however, that we must be content to wait patiently until the Government is satisfied respecting the efficiency and stability of our Institution, before we can expect to attain the ulterior advantages for which we are striving. When we consider how much important business engages the attention of the Government, and the length of time during which the projected Medical Bill has been under consideration, without having yet been completed, it is rather a matter of surprise that we have so soon succeeded in obtaining a charter, and our future progress, like our past success, must depend chiefly on ourselves.

We agree with our correspondent, that advantage might be derived from the appointment of a deputation to visit the principal towns in Great Britain, and canvass the subject in all its bearings. But of whom should the deputation consist? The Members of Council in London have already so much on their hands in managing the ordinary affairs of the Society, that it would be impossible for them, without neglecting other duties, to undertake the proposed mission. Moreover, the necessity for this measure, is in some degree superseded by the periodical circulation of a journal devoted exclusively to the professional concerns of our body, and containing information which ought to convince our readers that some improvement is required among us. There is one class of persons to whom all arguments whether in print or delivered orally, are, and must be, unavailing: we allude to those who insist upon being told in figures, the precise amount of profit which they may personally expect to receive from the outlay of two guineas a year, and whose minds are incapable of appreciating or even understanding the benefit which individuals derive from improvements of a public nature affecting the class to which they belong. Such persons would on the same principle refuse to pay the police rate (supposing it to be optional) until it should be pointed out how much property they would lose by robberies if they were not protected by the police; and similar arguments apply to every public rate, impost, or tax, which individuals are properly called upon to pay for the general benefit of the community of which they form a part.

The contribution to the PHARMACEUTICAL SOCIETY differs from the others above named in being voluntary, instead of being enforced by Act of Parliament. By means of the measures which we have hitherto adopted, we have warded off a threatened evil, and are now enjoying a degree of security which we could not have had if we had remained inactive; but

there are some persons who cannot perceive the connection between the exertions which have been made, and the result, and who are equally insensible of the fact, that the evils which we have escaped may yet come upon us if we neglect our duty. On this account an Act of Parliament would be desirable, since it would place the system on a more secure foundation.

While there are some whose notions are bounded by the confines of their own shops, there are others, and we have reason to believe a considerable number, who take a more enlarged, rational, and creditable view of the position of the Pharmaceutical Chemists of this country, as compared with that of our brethren in other nations. To this class of persons we must look for that continued support which will render the institution permanent and substantially useful. If there be any members who are lukewarm and disaffected, the secession of such will be to the Society like the pruning of a vine, which rids it of the useless branches; while the new members—those who come in by examination—will increase our strength, and tend to raise our professional character.

Our Liverpool correspondent alludes to the "very few additions which we have had since the examinations were instituted." This is a natural result of the great influx which had previously taken place; and it should also be recollected that those who did not avail themselves of the opportunity of admission, prior to the 1st of July, 1842, must of course require some time to prepare for an ordeal to which they had not previously looked forward. The examinations have already had a beneficial influence, as many young men have in consequence been induced to study their profession in a manner which they would not otherwise have thought necessary; and we have received information from several quarters in the country, that a considerable number of candidates are at this time preparing to present themselves for examination. This is a new feature in our department, in which no education has hitherto been insisted on; and no stronger argument is required in favour of the system which we are introducing, than the increase of industry and studious habits among our young men, in whom we may hope in course of time to see a class of Pharmaceutical Chemists more highly qualified than their predecessors. In order to ensure this consummation, perseverance for a few years is all that is required, with such sanction and assistance from the Government as our continued exertions may entitle us to claim.—Ed.]

EXTRACTED ARTICLES.

NEW TEST FOR CORROSIVE SUBLIMATE.

BY ALGERNON FRAMPTON, M.D.

It is now upwards of two years since, reflecting on the strong affinity of metallic silver both for metallic mercury and for chlorine, I triturated a grain of corrosive sublimate with several grains of pure metallic silver in powder, as it is procured by precipitation with copper from a solution of the nitrate, and in a dry state; and I was soon encouraged by the blackened appearance of the mixture to believe that decomposition of the bichloride had taken place, in some degree at least; and that this decomposition was complete, became evident when, upon placing the powder in the bulb of a small tube (such as is used in reducing arsenic), I obtained a distinct ring of metallic mercurial globules in the neck of the tube. Since that time, in obtaining metallic mercury from corrosive sublimate, I have always used silver, which I have not known to fail in producing its reduction, and have found much more convenient and manageable than the potassa fusa, commonly employed; this last not being easily pulverised, and attracting moisture to an inconvenient extent very rapidly. This objection, however, scarcely applies to the use of the bicarbonate of soda or potass.

I have subsequently endeavoured to ascertain whether metallic silver possessed the same power, and to what extent, over corrosive sublimate in solution; and in successive trials I have been able to obtain distinct, nay, abundant, metallic globules from the amalgam formed by boiling metallic silver in a solution containing one grain of corrosive sublimate in four ounces of distilled water, and even in a solution of half that strength, *i. e.* of one grain to eight ounces. My time does not allow me to make numerous comparative experiments, but I am disposed to believe that silver acts slowly, or not at all, on solutions of corrosive sublimate at the ordinary temperature.

I next tried this method of experimenting on organic mixtures; and having added one grain of corrosive sublimate to four ounces of tea, made with sugar and milk, I boiled the liquor with the powdered silver, and after allowing time for subsidence, the fluid was poured off. Liquor potassæ was boiled for some time upon the metal, to dissolve organic matter, and liquor ammoniæ afterwards added to the sediment, in order to dissolve the chloride of silver. This was also poured off, and the sediment having been washed and thoroughly dried, was placed in a tube as before, and metallic mercury obtained in abundance.

Two other experiments have also given very satisfactory results, in one of which one grain of corrosive sublimate, dissolved in a little distilled water, was mixed with a gelatinous fluid, made by diffusing 3j. by weight of the patent gelatine of the shops in 4oz. of New River water. In the other, one grain of the same substance in powder was added to 5ozs. of a sanguineous fluid, which had been obtained five days previously, by tapping, from the head of an hydrocephalous infant. The only modification in these cases was, that the mixture was acidulated with hydrochloric acid before adding the silver; this proceeding having been suggested by M. Reinsch's plan of testing for arsenic. It is necessary to moisten the silver by agitating it with a little distilled water in a tube, before adding to the suspected mixture; but, in the cases detailed, the metallic sediment has been very easily obtained, subsiding rapidly, and the results have been very satisfactory.

MERCK'S PROCESS FOR DETECTING SMALL QUANTITIES OF OPIUM.

In the analysis of Bengal opium, which is not yet introduced into the market of Germany, although it belongs to those specimens of opium which are very rich in alkaloids (containing, viz., eight per cent. of morphia, three of narcotine, one-half of codeine, and one per cent. of thebaine). E. Merck discovered, five or six years back, a peculiar resinous vegetable substance, soluble in alcohol and ether, and assuming a red or purple colour when heated with diluted muriatic acid, and thence called *porphyroxine* (from *πορφύρεος purple* and *ὄξυς acid*).

Merck convinced himself that porphyroxine is present in other varieties of opium, and offers a ready means for detecting the latter where it exists in very small quantities, or in compounded medicines. His recent experience on this substance was communicated at the general meeting of the Union of Apothecaries in the Archdukedom of Hesse, on 20th September, 1842.

As the subject is not without interest, we extract the following observations from Merck's former paper (*Ann. der Pharm.*, Band xxv., S. 201):

"In treating powdered opium with boiling ether, we obtain, on evaporation, a fatty glutinous residue, with crystals of meconine and narcotine. The codeine, thebaine, and morphine are scarcely soluble in ether, because these alkaloids exist in the form of salts. If the oily-resinous extract of opium, prepared with ether, be treated with boiling water, the meconine is dissolved, and the narcotine may be procured in solution by alcohol; but in the latter solution the porphyroxine will be contained, which, on evaporation of the alcohol, will remain as a resinous residue; and, if boiled with hydrochloric acid, in which it is dissolved, together with the meconine, will assume a purple colour.

"Porphyroxine has the following properties: it crystallizes in the form of shining needles; is perfectly neutral; produces an olive green colour, with concentrated sulphuric and nitro-sulphuric acids; is dissolved by diluted sulphuric, muriatic, or nitric acid; and produces at the boiling point a purple or rose colour, according to the concentration of the solution.

"Alkalies discolour the fluid, and yield a white precipitate. Acids of every description, even acetic acid, reproduce, with this precipitate, the red colour at the ordinary temperature. The purple muriatic solution yields a carmine precipitate with tannin and the salts of tin. A solution of gold gives a dirty red, sugar of lead a rose-coloured precipitate; chloride of iron produces a brown precipitate, and the red colour totally disappears; the sulphate of copper does not alter the red colour.

"Porphyroxine is soluble not only in diluted acids but in alcohol and ether, without any discolouration. Alkalies precipitate this substance, from an acid solution as a copious loose mass, which melts on being heated to a resin, and on cooling becomes friable.

"To detect opium in a compounded medicine or mixture, the fluid is first to be decomposed by potash, and shaken together with ether. A strip of white bibulous paper is to be repeatedly moistened with this etherial solution; drying it after each time of moistening. If the paper be now wetted with muriatic acid, and exposed to the vapour of hot water, it will become more or less red, if opium be present.

"In conclusion it must be remarked, that porphyroxine is soluble in acetic acid, but is not reddened on the application of heat—further, that it is, like all resinous substances, insoluble in water, consequently does not exist in an aqueous extract of opium, and very little of it will be contained in a vinous tincture of opium."—*Repertorium für die Pharmacie, by Dr. Buchner Zweite Reihe*, Band xxxi, Heft i, page 104—108.

DETECTION OF ARSENIC BY COPPER.

BY HUGO REINSCH.

This process consists in *acidulating the arsenical fluids with muriatic acid, and boiling them with metallic copper, which then becomes covered by a steel-gray crust of metallic arsenic.* The separation of arsenic by this method is so complete, that no traces of it can be detected in the residual fluid by means of Marsh's apparatus.

Besides the precious metals (which are readily distinguished by their colour or brilliancy), bismuth and antimony are the only metals which are precipitated in these circumstances ; but bismuth is always deposited in the crystalline form, and antimony constantly covers the copper with a metallic pellicle, which is of a violet tint in weak solutions, and greyish-white in those more concentrated. These two metals are more precisely distinguished by characters which will be indicated in the sequel.

When acids, such as the phosphoric, sulphuric, or acetic, containing arsenic, are boiled with metallic copper, the latter preserves its brilliancy unchanged, neither is it affected by an aqueous solution of arsenious acid ; but as soon as a few drops of concentrated muriatic acid are allowed to fall on the copper whilst the fluid is still warm, it is instantly covered with the characteristic steel-grey crust of metallic arsenic. This test is sensible in a fluid which contains only the millionth part of five centigrammes of arsenious acid !

To ascertain if this test is applicable to the detection of arsenic when mixed with food, M. Reinsch prepared a mixture of boiled potatoes, milk, and soup, and introduced gr. 0.025 of arsenious acid into the mixture. He digested the whole with pure muriatic acid, diluted with an equal weight of water, boiled the liquor, filtered it, and treated it with slips of copper ; these were immediately covered with the arsenical pellicle, exactly as if the arsenic had been dissolved simply in acidulated water, or the mineral acid. This method thus appears to be susceptible of the same applications as Marsh's process, without some of its inconveniences. It cannot, like the latter, give rise to mistakes from the formation of false stains derived from organic matters, or from the employment of arseniuretted zinc, or from the troublesome frothing of the liquid. All that is necessary for medico-legal purposes is, to digest the contents of the stomach and intestines with diluted pure muriatic acid, and to treat the filtered liquid with slips of copper. In the same way the existence of arsenic in the bones may be demonstrated.

To determine the other properties of arsenic, and to obtain conclusive evidence of its presence or absence, the author recommends the following proceeding :—The slip of copper covered with the metallic crust is to be carefully washed with water in the same vessel in which it has been boiled with the suspected liquid, and is then to be very cautiously dried over the flame of a candle. It is then to be slipped down to the centre of a glass tube about sixteen inches long, one end of which terminates in a capillary orifice, whilst to the other is closely adapted a small bent tube, having its lower end furnished with a perforated cork. The part of the tube where the copper slip lies is then to be heated for a short while with a spirit lamp, when arsenious acid sublimes along the tube in small but well-formed brilliant crystals. If during the heating a gentle current of air is blown into the lower orifice of the small bent tube, the arsenious acid forms a white vapour which condenses towards the end of the tube with the capillary orifice. If we wish to test the arsenic in this tube, we have only to seal up the capillary orifice, cut off this end of the tube, and having dissolved the arsenic, may apply to it the usual liquid tests, or it may be introduced into

Marsh's apparatus. If, on the contrary, we wish directly to obtain the metallic arsenic on a porcelain plate, we are to adapt, by means of the cork, the bent tube to an apparatus for disengaging hydrogen, and inflame the gas at the capillary orifice. We ascertain the purity of the gas by holding the porcelain plate over it whilst it burns, and then heat the portion of the tube containing the slip of copper ; arseniuretted hydrogen is immediately formed, and the metallic crust is obtained on the porcelain ; a little arsenious acid is always formed, but by continuing the heat this is equally converted into arseniuretted hydrogen. The disengagement of arseniuretted gas may be continued or interrupted at will by withdrawing the spirit lamp, for the gas does not present any trace of arsenic when the tube cools, but it appears again on re-applying the heat.

If antimony is present, we obtain somewhat similar results, but the sublimate from this metal is not so manifestly crystalline, nor so volatile as that from arsenic. Ordinarily, there is also formed by the passage of the current of hydrogen, a layer of metallic antimony in the tube ; M. Reinsch has never observed this to occur with arsenic. The presence of antimonious acid can likewise be demonstrated in the tube as easily as that of arsenic.

The author conceives that, compared with Marsh's method, his own process has undoubted advantages. These he conceives to be :—

1. Its execution is easier, and requires less time than Marsh's method.
2. It cannot give rise to errors, because the arsenic can be obtained at first in the metallic state, then in the form of arsenious acid, and again in the metallic state on the plate of porcelain, without any loss.
3. It is exempt from the inconveniences of the frothing of liquids, the carbonization of tissues, &c.
4. It equals Marsh's method in point of sensibility, since we are able by it to detect a millionth part of arsenic in a fluid.—*Repertorium für die Pharmacie*, vol. xxvii. p. 13 ; *Journal de Pharmacie et de Chimie*, Nov. 1842, and *London and Edinburgh Monthly Journal of Medical Science.*

ON THE ACTION OF NITRIC ACID ON ALCOHOL.

BY M. MILLON.

The attempts which have hitherto been made to combine nitric acid with ether, have been unsuccessful. This has formed a curious gap in the extensive series of compound ethers, and the absence of this combination has been the more remarkable since the discovery of the nitrate of methyl.

The influence which nitrous acid, mixed with nitric acid, exercises on the mode of oxidation of metals, made me think that the production of nitrous acid might equally modify the oxidation of organic substances by nitric acid. I have been enabled, in fact, completely to change the action of nitric acid on alcohol, by preventing the production of nitrous acid ; and it is only necessary for this purpose to add a few crystals of nitrate of urea to the mixture of acid and alcohol. The distillation may then be conducted with ease over an open fire ; and instead of the strong and tumultuous reaction which, by the old process, furnishes *nitrous* ether, mixed with a number of other products, we have a regular distillation, affording a new product, *nitric* ether, accompanied only with a little water and alcohol.

The nitric acid used in this process ought to be carefully purified ; the presence of hydrochloric acid would render the nitrate of urea useless, as the ordinary action which takes place between nitric acid and alcohol would ensue.

The proportions of acid and alcohol employed are not unimportant. The process always succeeds very well on using one volume of nitric acid with four equivalents and a half of water, the density of which is 1.401, and

two volumes of alcohol, sp. gr. 837, which will be about equal weights of the acid and alcohol. If the nitric acid and alcohol be used in equal volumes, the nitrate of urea will again be of no use.

It is well, also, not to operate on too large a quantity; the mixture of acid and alcohol ought not to exceed four or five ounces, and from fifteen to thirty grains of nitrate of urea will be sufficient to regulate the action.

The mixture should be heated gradually. The first product of the distillation contains only weak alcohol, but presently the nitric ether will be indicated by its peculiar smell; and on adding water to the distilled product, a liquid heavier than water will separate, which is the nitric ether. Subsequently, this will come over so abundantly as to form a dense stratum in the receiver.

If the distillation be continued until all the contents of the retort be carried over, a violent action will take place towards the end of the operation; but on arresting the process, when about an eighth part of the mixture remains, the nitrate of urea will be left unaltered, and will soon be deposited from the acid residual liquor. This residue may be employed for a second, a third, or even a fourth distillation.

If the nitrate of urea employed should have been yellow or much coloured, it will be recovered after this process perfectly white; so that a double process may thus be combined, for the purification of nitrate of urea, and the preparation of nitric ether.

For this purpose the rough nitrate of urea may be used, in the state in which it is obtained on precipitating concentrated urine with nitric acid; the precipitate is pressed in a cloth, and then introduced into the mixture of nitric acid and alcohol. The distillation may be continued until the nitrate of urea forms a crystalline crust on the surface of the liquid.

The method of purifying this ether, is similar to that adopted towards formic ether and several other compound ethers. It is first washed with an alkaline solution, then with distilled water, and, subsequently, allowed to stand for a day or two in contact with chloride of calcium, after which it is distilled.

The composition of nitric ether, in a state of purity, is represented by the formula $Az\ O_5, C_4\ H_5\ O$.

An aqueous solution of caustic potash does not decompose it; but an alcoholic solution decomposes it even in the cold, yielding abundance of crystals of nitrate of potash, without the least trace of nitrite.

The smell of nitric ether is sweet and agreeable; it does not at all resemble that of nitrous ether. It has a saccharine taste, leaving a slight impression of bitterness. The density is greater than that of water, being 1.112 at 62° Fahr. It boils at 185° Fahr., and burns with a white flame. It decomposes at a temperature a little higher than its point of ebullition.

I have succeeded several times in inflaming, without explosion, globes of the capacity of 200 or 300 grammes, filled with the vapour of nitric ether; but, in taking the density of this vapour with Dumas's apparatus, the globe has always been broken with violence at the moment that the slender tube was sealed by means of the blow-pipe.

Nitric, hydrochloric, and sulphuric acids decompose the nitric ether rapidly. Iodine dissolves in it, communicating a fine violet colour. Chlorine attacks, but at the same time decomposes it; this action being accompanied with an abundant production of nitrous vapours.

The intervention of nitrate of urea in the production of nitric ether is explained by the action of nitrous acid on urea. Nitrous acid immediately decomposes urea into equal volumes of nitrogen and carbonic acid gases; so that it necessarily follows, from the presence of urea, that no nitrous acid is formed at the expense of the nitric acid.— *Comptes Rendus, and Annales de Chimie et de Physique.*

COMPARATIVE EXAMINATION OF SEVERAL KINDS OF SARSAPARILLA.

BY CL. MARQUART.

The following experiments were made on 250 grains of each variety of Sarsaparilla.

	VERA CRUZ.	LISBON.	HONDURAS.	LIMA.	CARACCAS.	JAMAICA.	HONDURAS (?)
	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
Quantity of extract obtained by infusion	25	14	12	36	16	28	26
Colour of the infusion	Pale brown.	Brown passing into reddish.	Somewhat pale brown.	Very red.	Pale brown.	Red-brown.	Red-brown.
Amount of matter contained in the extract which was soluble in rectified spirit	23	10	10	26	12	14	18
The residue contained	Sulphuric acid.	Sulphuric acid and albumen.	——	Sulphuric and phosphoric acids and potash.	Gum.	Potash and sulphuric acid.	Potash.
Quantity of extract obtained by decoction	32	26	24	42	22	40	—
Colour of the decoction	Dark brown.	Reddish brown.	Pale brown.	Dark red.	Brown.	Red-brown.	——
Amount of matter contained in the extract which was soluble in spirit	25	16	12	28	12	22	—
The residue contained	Starch.	Starch.	Starch.	No Starch.	Starch.	No Starch.	—

The alcoholic solution of all these varieties of sarsaparilla had, without exception, an *acid reaction*. *Lime water* produced no turbidity or precipitate, even by standing; but by boiling a moderately voluminous precipitate was formed in all the varieties, except the Lima kind and that marked "Honduras (?)"; but the precipitate subsided very imperfectly. *Oxalate of ammonia* did not render the solutions turbid, or but very slightly so; and gave, by standing for twenty-four hours, a scanty white sediment. *Acetate of lead* gave a copious fawn-coloured precipitate with all the solutions, except that of the Vera Cruz variety, which only became strongly turbid and yielded a copious precipitate only after standing twenty-four hours. The precipitates were roe coloured, but in the case of the Jamaica and Honduras (?) varieties, were of the colour of chocolate. The following tests, however, gave different results:—

TESTS.	VERA CRUZ.	LISBON.	HONDURAS.	LIMA.	CARAECAS.	JAMAICA.	HONDURAS (?).
Sesquichloride of Iron..	Dark colour. *In 24 hours*, dark colour.	Dark colour, and considerable precipitate. *In 24 hours*, a considerable grey sediment.	Blackish-brown colour. *In 24 hours*, a blackish-brown colour, and precipitate.	Dark-brown colour, almost black. *In 24 hours*, blackish-brown colour, and copious precipitate.	Blackish-brown colour, and precipitate. *In 24 hours*, dark liquid, and considerable greyish-brown precipitate.	Blackish-brown colour, and considerable precipitate. *In 24 hours*, considerable grey sediment, and blackish-brown colour.	Blackish-brown colour, and copious precipitate *In 24 hours*, considerable blackish-brown precipitate.
Bichloride of Mercury..	Very slight turbidity. *In 24 hours*, turbidity, and a very heavy, pale-brown sediment.	No turbidity. *In 24 hours*, turbidity, and a slight, pale, earth-coloured precipitate.	Slight turbidity. *In 24 hours*, a heavy firmly adherent earth-coloured sediment.	No turbidity. *In 24 hours*, a heavy whitish precipitate.	No change. *In 24 hours*, a whitish firmly adherent sediment.	No change. *In 24 hours*, a whitish heavy sediment.	Slight turbidity. *In 24 hours*, considerable lighter sediment.
Sulphuric Acid.....	No change. *In 24 hours*, no change.	Very slight turbidity. *In 24 hours*, a slight sediment.	No change. *In 24 hours*, no change.	No change. *In 24 hours*, a copious voluminous precipitate.	No change. *In 24 hours*, a slight precipitate.	Slight turbidity. *In 24 hours*, copious reddish-brown sediment.	No change. *In 24 hours*, a copious chestnut-brown precipitate.
Nitrate of Silver	Slight turbidity. *In 24 hours*, a grey colour; by boiling becomes grey-brown. Nitric acid produced a yellowish-white precipitate, soluble in ammonia.	Pale colour, and copious precipitate *In 24 hours*, a copious yellowish white precipitate, which was not soluble in nitric acid, but was in caustic ammonia.	Copious precipitate *In 24 hours*, a copious whitish-grey precipitate, soluble in caustic ammonia only.	Copious precipitate *In 24 hours*, copious whitish precipitate, soluble in caustic ammonia.	A considerable precipitate, and brownish-yellow colour. *In 24 hours*, a considerable dirty-white precipitate, soluble in ammonia.	Copious precipitate *In 24 hours*, a copious flesh-coloured sediment soluble in ammonia.	Copious precipitate *In 24 hours*, copious sediment, soluble in caustic ammonia.
Caustic Ammonia	No change. *In 24 hours*, a voluminous sediment.	No change. *In 24 hours*, a slight sediment.	No change. *In 24 hours*, a pretty copious and voluminous precipitate.	No change. *In 24 hours*, small crystals had formed on the sides and bottom of the vessel.	No change. *In 24 hours*, no change.	Dark colour. *In 24 hours*, dark-brown colour, and slight white sediment.	Dark colour, and precipitate. *In 24 hours*, a slight flesh-coloured precipitate.
Solution of Gelatine.....	No change. *In 24 hours*, no change.	No change. *In 24 hours*, no change.	No change. *In 24 hours*, no change.	A considerable precipitate. *In 24 hours*, the precipitate was adherent to the sides and bottom of the vessel.	No change.	A precipitate. *In 24 hours*, it was firmly adherent.	A precipitate.

ANALYSIS OF LOBELIA INFLATA.

BY REINSCH.

Two varieties of this plant, a native of North America, are met with in commerce. That marked "*Lobelia Inflata, new Lebanon,*" was selected for experiment as being the purer.

The decoction of lobelia is of a pale-brown colour, does not froth, leaves a peculiar pungent taste, especially in the fauces, is rendered slightly turbid by alcohol and acids, becomes brown on addition of ammonia, but not blue with iodine. It is rendered turbid, and assumes a brownish-green colour on the addition of acetate of iron; it forms a copious yellow precipitate with acetate of lead, and a white precipitate with tincture of galls.

By distillation of the plant with water, a neutral turbid fluid may be obtained, which emits the odour of hay, and from which a small quantity of volatile oil, with a bland taste but pungent odour, may be separated.

Analysis gave the following results :—

Water			0.110
Volatile oil			not determinable.
Alcoholic extract	Chlorophylle		0.055
	Wax		
	Resin		
	Stearine		
	Peculiar substance, (Lobeliin)		0.022
	Aromatic resin		0.013
Aqueous extract	Vegetable gluten		0.028
	Mucous gum		0.060
	Potash, lime, magnesia, iron and manganese salts with organic and inorganic acids		0.024
Extracted by potash	Mucous gum		0.424
	Vegetable fibre		0.266
			1.002

The substance called *lobeliin* was obtained by treating an alcoholic extract with ether; evaporating and digesting with alcohol of ninety-four per cent.; again evaporating the solution, and dissolving the extract in water. This solution has an acid reaction; is of a yellow-brown colour, tastes slightly bitter, and leaves a pungent after-taste, similar to that of tobacco. On evaporating it, the lobeliin remains. In the dry state it is a shining, yellowish, hygroscopic, gum-like substance; melts readily on a platina spoon, emitting a pungent vapour; swells with the heat, and burns with a bright flame, until it is totally consumed, leaving scarcely a trace of ash. It is soluble in water and in alcohol—not in ether. The aqueous solution froths slightly, if shaken. It is not rendered turbid by ammonia; but the colour is slightly darkened. Acids effect no alteration in it. Tincture of iodine renders even a weak solution turbid, and produces a reddish-brown colour with it. Tincture of galls gives a copious white flocculent precipitate. Acetate of iron produces a dark-brown colour. Acetate of lead, acetate of copper, solution of tartaric acid, proto-muriate of tin, and solution of bichloride of mercury do not react on it. Nitrate of mercury gives a light yellow, and nitrate of silver a white precipitate; the latter changes quickly, and assumes a reddish-brown tint. It is clear, that lobeliin, obtained in this manner, is not pure, as it retains a portion of nitrogenous vegetable gluten, which is not to be separated from it by pure alcohol nor by water.

As vegetable gluten, we have mentioned that portion of the alcoholic

extract which is insoluble in pure alcohol, but soluble in water. It forms a gummy product; when dried, it is a brittle, shining, slightly bitter substance, which froths strongly if a solution be made and shaken; gives, when exposed to heat, evidence of containing nitrogen, and does not coagulate if a solution of it be boiled.

By mucous gum is understood a substance found in the aqueous decoction, and in the alkaline extract, which does not gelatinize with alcohol and acids; yields, on boiling with alkalies, neither pectic acid nor humin; gives, with alcohol, neither a flocculent nor a gelatinous, but a mucilaginous precipitate, and is not discoloured by iodine.—*Pharmaceutisches Central-Blatt*, No. xxxi., *Juli* 5, 1843.

ON THE MODE OF PREPARATION AND THERAPEUTIC PROPERTIES OF ERGOTINE.

BY M. BONJEAN.

About a year ago, I addressed a memoir to the Academy of Sciences on the ergot of rye.* Since that time, I have made some essential modifications in the preparation of a product, which I then called *hæmostatic extract*, and which I now call *ergotine*. This product appears to me to possess very valuable medicinal properties, and I am anxious to make known the improved method of preparation on which the success of the remedy, in some measure, depends.

The method by which I formerly obtained my hæmostatic extract was as follows:—Exhaust the powdered ergot of rye with cold water, by means of a displacement apparatus, and then evaporate the solution to a solid consistence.

The process which I now adopt is the following:—Exhaust the powdered ergot as before, with cold water, by displacement, and heat the aqueous solution by a water-bath. By the action of the heat the liquor is sometimes coagulated, from the presence of a certain quantity of albumen; sometimes there is no coagulation. In the former case, separate the coagulum by filtration; concentrate the filtered liquor, in a water-bath, to the consistence of a syrup; then add a large excess of alcohol, so as to precipitate all gummy matter; let the mixture stand until the precipitate has entirely subsided, then decant the clear portion, and evaporate it in a water-bath to the consistence of a soft extract. In the latter case, at once reduce the liquor to a half syrupy state, and treat it with alcohol, as already described; then reduce it to an extract.

In this way a soft extract is obtained, of a reddish-brown colour, very homogeneous, having an agreeable smell of roast meat, due to the presence of osmazome; and a rather sharp bitter taste, somewhat resembling damaged corn. It forms with water a fine red solution—limpid and transparent. 500 parts of ergot of rye furnish 70 or 80 parts of extract.

It is well known that much inconvenience has been experienced in the medicinal employment of ergot of rye, so as almost to cause its rejection as a therapeutic agent, in consequence of its well-established valuable properties being associated with an active poison. Having been engaged for four years in experimenting on this substance, I have been enabled to explain the cause of the different effects produced; and nothing is easier now than to separate the two principles contained in the ergot — principles entirely different in their operation — the one, *ergotine*, acting principally on the arterial integuments; while the other, *the oil*, acts on the nervous centres.

The ergotine is a real specific for hæmorrhages in general. The most violent hæmorrhages and vomitings of blood are stopped in a very short time

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* See Pharmaceutical Journal, vol. i., p. 334.

by the employment of this remedy ; and their recurrence is rare, if the precaution be taken of continuing the medicine for some time after the cessation of the symptoms.

To determine further that the *ergotine* is the obstetrical principle of the ergot of rye, it is only necessary to treat the ergot in powder with ether, by displacement, until it is entirely exhausted of all matters soluble in that menstruum. The whole of the poisonous part, that is, the oil and the resin, will be thus removed, and a powder will remain, which is not at all unctuous, but rough like sand, without any taste, or poisonous action, and which strongly excites the uterine contractions, in doses of six or eight grains.—*Comptes Rendus.*

ON THE PREPARATION OF SYRUP OF BALSAM OF TOLU.

BY M. SOUBEIRAN.

M. E. MARCHAND, of Fécamp, has proposed the following formula for the preparation of the syrup of balsam of tolu :—

Take of Balsam of Tolu, 16 parts.
White Sugar, 32 parts.
Cold Water, 60 parts.
Simple Syrup, cold, 1000 parts.

Rub the balsam with the sugar to an impalpable powder, place it in an earthen or tin pot, mix the water with it, then pour the syrup, boiling, over it. Stir it from time to time until cold, keeping it covered while at rest, and finally, in twelve hours time, filter it through paper.

M. Marchand has intended, by this formula, to effect a diminution of the proportion of balsam of tolu, without injuring the quality of the product. He has thought that the syrup acting on the balsam previously divided by the sugar, would be more likely to effect the solution of the whole of the soluble parts, than if the balsam were submitted to the action of water alone.

The syrup made according to this formula is agreeable, but what syrup of tolu is not so ? I object to it as being weaker and less agreeable than that made according to the Codex : this may easily be determined by a comparison of the two.

The Codex orders the balsam of tolu and sugar to be used in the proportion of 1 : 8. In accordance with the observation of M. Deville, I found by experiment*, that without altering the quality of the syrup, this proportion may be reduced one half, and I therefore adopted the proportion 1 : 16. M. Marchand carries it to 1 : 44.

After having convinced myself, by a preliminary experiment, that M. Marchand's syrup was not sufficiently strong, I made some more, following his formula, but employing a fourth part of the balsam ordered by the Codex. I already knew that the syrup made in this proportion by the direct action of the water on the balsam, was deficient both in taste and smell ; when made according to M. Marchand's formula, it was more highly charged, and many persons considered it good and agreeable, until made to taste it in comparison with that of the Codex.

The latter has an agreeable perfume and taste, which the former is deficient in. M. Marchand's syrup offends both by its odour and especially by its resinous acridity. An amateur gourmand would not hesitate a moment between the two products. I therefore recommend the employment of the balsam of tolu in the proportion of 1 : 16, making a first liquor by the digestion of the balsam of a previous operation, and using this infusion for treating a new quantity of fresh balsam.—*Journal de Pharmacie.*

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* See PHARMACEUTICAL JOURNAL, vol. i. page 430.

CHEMICAL ANALYSIS OF THE BITTER EXTRACTIVE OF CHINOVA.

BY SCHNEDERMANN.

This analysis, conducted at the request of Dr. Wöhler, proves the bitter extractive to be identical with the chinovic acid of Caventon and Pelletier; and that it differs, as the analysis of Petersen also shows, materially from smilacine.

The mean of four experiments, which well corresponded, gave the following composition:

Carbon.....	67.68
Hydrogen.....	8.98
Oxygen	23.34

The result of his experiments, which were carefully conducted, led him to the conclusion, that a combination with copper gives the formula, $Cu + C_{38} H_{29} O_9$, and that of the free acid, $H_2 O + C_{38} H_{29} O_9$.

The composition of chinovic acid consequently, calculated after this formula, would be

Carbon	67.71
Hydrogen.....	8.79
Oxygen	23.50

Numbers which agree perfectly with the result of the analysis. The examination of a salt of lead gave the following formula, $Pb O, C_4 H_3 O_3 + 2 (Pb O, C_{38} H_{29} O_9)$.—*Buchner's Repertorium für die Pharmacie Tweite Reihe, Band.* xxxi., *Heft.* 1.

NEW METHOD OF OBTAINING THE BITTER PRINCIPLE OF WORMWOOD.

BY M. RIGHINI.

Take of

Extract of wormwood, made with proof spirit, one part.

Distilled water, twenty-four parts.

Rub down the extract with the water in a mortar, then filter the mixture, and having put the clear liquor into a matrass, add

Purified and finely powdered animal charcoal, six parts.

Close the mouth of the matrass, and heat it in a water-bath for half an hour; after which, having prepared a filter containing another six parts of powdered animal charcoal, well washed with boiling water, pour the solution of the extract over this, and cover the filter to preserve the solution from the action of the atmospheric air. The liquor which passes through the filter will be perfectly transparent and insipid, and is to be rejected as useless.

The filtration being terminated, collect the charcoal, which contains the whole of the bitter of the wormwood, and treat it with pure spirit, sp. gr. 0.835, in quantity double the weight of the substance operated upon. The bitter principle will be obtained, dissolved in the spirit, by filtration, and the greater part of the spirit may be recovered by distillation in a water-bath. The residue of this operation, concentrated to any required degree, constitutes the pure bitter of wormwood.

The bitter matter of wormwood is a tonic agent of great energy, and entirely free from acrimony. It contains nothing stimulating, for even in large doses it does not accelerate the circulation or raise the animal heat.—*Journal de Chimie Médicale.*

ON THE ADULTERATION OF THE RESIN OF JALAP.

BY M. GOBLEY.

Commercial resin of jalap is rarely, if ever, obtained in a state of purity. Resin of guaiacum is the substance most frequently found mixed with it.

Two methods have been pointed out for detecting this fraud: one by means of ether, the other by means of nitrous gas.

Employment of Nitrous Gas.—This process consists in dissolving a small quantity of the suspected resin in spirit of wine, soaking a piece of white paper in this liquid, and exposing this paper to the action of nitrous gas.* If the alcoholic solution of resin of jalap contain guaiacum, the paper should assume a blue colour; if no guaiacum be present, the colour will remain unaltered. But is it possible, by this proeess, to detect minute quantities of guaiacum in the resin of jalap? To satisfy myself on this point, I made two solutions: the first was prepared with ten grammes of resin of jalap (obtained by Planche's method) and forty grammes of alcohol; the second, with one gramme of guaiacum and ninety-nine grammes of alcohol. A gramme of the latter solution, therefore, contained a hundredth part of guaiacum, or a thousandth part of the quantity of resin of jalap contained in the first solution.

Having prepared and filtered these two solutions, I added successively to the solution of resin of jalap, one gramme at a time of the solution of guaiacum. On each addition, a piece of white paper was dipped into the mixture, and then exposed to the action of the nitrous vapour. It was not until after the addition of twenty thousandths, that the paper became sensibly coloured blue. It is important that the nitrous vapour to which the paper is exposed should not be in considerable quantity, otherwise the blue colour disappears almost as soon as it is manifested. These twenty thousandths are equal to two per cent. of the resin of jalap used; it is only, therefore, when resin of jalap contains at least two per cent. of guaiacum, that the adulteration can be detected by means of nitrous gas.

Employment of Ether.—Ether dissolves guaiacum very well, but does not dissolve resin of jalap, a circumstance first noticed by Planche. In fact, on treating one part of pulverized resin of jalap with fifteen parts of rectified ether, and decanting the fluid after twelve hours' contact, during which time the mixture was frequently agitated with a glass rod, I obtained, by evaporation, only a small quantity of fatty matter, but not the least portion of resin of jalap.

It is on the solubility of the resin of guaiacum, and the insolubility of the resin of jalap, in ether, that the process now under consideration is founded, for detecting the presence of guaiacum in jalap-resin. But, is it possible, by this process, to detect minute quantities of guaiacum? To satisfy myself on this point, I weighed ten grammes of resin of jalap, and one centigramme of guaiacum: these were dissolved in a sufficient quantity of alcohol, and then evaporated and reduced to a state of powder, the powder being introduced into a stoppered bottle with some rectified ether. After remaining in contact for an hour, and stirred up, from time to time, with a glass rod, the etherial solution was decanted. On evaporation, a small quantity of fatty matter remained, and the portion of water contained in the ether, became milky from the presence of guaiacum. In fact, on adding a few drops of alcohol, a perfectly transparent liquor was obtained, floating on the fatty matter. A piece of paper wetted with this liquor,

* Nothing is more simple than the method of procuring the nitrous gas; it is only necessary to pour a few drops of nitric acid over some iron filings placed in a test glass.

and exposed to the action of a weak disengagement of nitrous gas, acquired a blue tint. I say a weak disengagement, because if this be not attended to, the blue colour disappears immediately after its production, and the presence of the guaiacum may be considered doubtful. Ether is therefore the best agent for determining the purity of resin of jalap, as it allows of the isolation of the smallest quantities of guaiaeum. Thus all resin of jalap which yields to ether a portion of the resinous matter, should be rejected. Colophony (black resin), which is also sometimes mixed with commercial resin of jalap, is similarly circumstanced.—*Journal de Chimie Médicale.*

COLOURLESS JALAP-RESIN IN COMMERCE.

Herberger has met with a cheap colourless resin of jalap, which is brittle and friable, emitting, when heated, the well-known odour of jalap-resin ; very soluble in spirit, nitric acid, alkalies, and pure ether ; oil of turpentine dissolved about 65 per cent. of it. It was insoluble in the fatty oils. A solution did not react as an acid. This resin is not pure resin of jalap, nor the resin of boletus laricis ; but approaches nearest to the resin obtained from stalky jalap, now become obsolete in the market, and which was, perhaps, sold off in this form. The author has, however, met with pure jalap-resin in commeree.—*Pharmaceutisches Central-Blatt*, No. xxxi., *Juli* 5, 1843.

ON THE FATTY MATTER CONTAINED IN BEER.

BY DR. VOGEL, JUN., OF MUNICH.

Beer belongs to those substances which exert a considerable influenee over the formation of fat in the animal body, although the actual quantity of fatty matter which it contains is very small.

By the evaporation of beer there is obtained a brown glutinous residue. This was dried at 212° Fahr. by a water-bath, and then pulverized. The powder repeatedly digested in ether yielded a yellow oily fat, with a peculiar odour resembling malt, and which may be collected in drops by evaporating the ether. With alkalies, it forms soluble soaps, and leaves a fatty stain on bibulous paper. Under the microscope the fatty globules are distinctly visible. As regards the quantity, three different experiments gave in 100 parts of extract 0.1605 of substance soluble in ether. One quart of Munich Winter beer yields, by evaporation, 18 ʒ of extract; consequently, in one quart of beer 1.728 grains of fatty matter are taken into the system. If, therefore, an individual drink two quarts daily, he would, according to this calculation, receive in the course of a year only $2\frac{1}{2}$ ℥ ʒ of fatty matter—a quantity which by no means corresponds with the well-known increase of corpulence in habitual beer-drinkers. We must, therefore, look for the fattening quality of beer in its other constituents, as Professor Liebig has observed in his theory of the formation of fat in animals.—*Annalen der Chemie und Pharmacie, Band.* xlvi., *Heft.* 2. *May*, 1843.

MEDICAL LEGISLATION IN FRANCE.

[Although the Medical and Pharmaceutieal Institutions in France are under the regulation of the government, and much greater proteetion is afforded to qualified praetitioners than is the case in this eountry, it would appear that there are some medical reformers abroad who are not perfectly

satisfied, and various private institutions have been formed for the purpose of bringing about further improvements, and extending the privileges of the profession. The following statement will give an idea of the kind of reform which is desired.]

The *Permanent Section of the Medical Sciences* sitting at Strasbourg announces, that the following subjects will come before the Scientific Congress this year, in the month of September. 1st. A means of enforcing a strict execution of the laws relating to the exercise of medicine and pharmacy. 2d. The creation of provincial Physicians in all the departments of France, and the regulation of their privileges. 3d. The propriety of abolishing the title of *Officier de Santé.* 4th. The legal establishment of Boards of Health throughout France, and the regulation of their prerogatives. 5th. The establishment, in the chief place in each department, of permanent medical chambers, to watch over the general interests of the profession. 6th. Modifications in the legal exercise of the practice of physic in France. 7th. The absolute suppression of secret remedies, and the reform of the law relating to the sale of poisons. 8th. The propriety of a periodical revision of the pharmaceutical codex. 9th. The necessity of establishing a uniform grade for the Pharmaciens throughout France. 10th. The limitation of their numbers, according to the requirements of the several localities; the establishment of a tax on medicines, and, 11th, The creation of Syndic Chambers for Pharmaciens.—*L'Expérience*, No. 315.

UNIVERSITY OF LONDON.

QUESTIONS ON CHEMISTY, MATERIA MEDICA, AND BOTANY, PROPOUNDED AT THE EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICINE. 1843.

PASS EXAMINATION.

CHEMISTRY.

Examiner, PROFESSOR DANIELL.

1. A saline powder will be placed before you with a blow-pipe, lamp, and charcoal: test the powder, state its composition, and describe the phenomena which it presents by the application of the flame, and explain their causes.

2. A saline solution will be placed before you marked A, with appropriate tests: explain the changes which will take place upon their application, and name the acid and base of which the salt has been composed.

3. What was the great fault of the Thermometer as originally constructed by the Italian philosophers at the beginning of the 17th century? and how was it corrected by Sir Isaac Newton?

4. Describe the processes by which uniformity of temperature is brought about in a system of bodies originally of different temperatures, and the principal circumstances which influence each.

5. Describe and explain the principal phenomena of Electric Induction.

6. What were the respective shares of Galvani and Volta in the discovery of Galvanism or Voltaic Electricity? Describe and explain the fundamental experiments of each.

7. What are the principal advantages which the science of Chemistry has derived from the establishment of Dalton's Atomic Theory ?

8. How may the presence of Nitrogen be detected, and its amount be ascertained in an Organic Compound ?

9. What is Phosphorus ? State its principal physical properties, its equivalent number, and describe its combinations with Oxygen.

MATERIA MEDICA AND PHARMACY.

Examiner, Dr. Pereira.

1. Describe the method of preparing the *Antimonii Potassio-tartras* according to the London Pharmacopœia, and explain the chemical changes which attend the process. State the composition, effects, uses, and doses of this salt, and also the tests by which its presence may be recognised.

2. Give the botanical characters of *Aconitum Napellus*. Mention the peculiarities of its action on the system ; name the diseases for which it is especially adapted ; and state the best mode of using it externally as well as internally.

3. How would you distinguish *Liquor Sodæ effervescens*, Ph.L., from mere carbonic acid water ? With what metal is the Soda Water of the shops frequently contaminated, and how would you detect the impurity ?

4. What are the appropriate doses, for an adult, of the following substances : Benzoic Acid, Sal Ammoniac, Trisnitrate of Bismuth, Biniodide of Mercury, and Bromide of Potassium ?

5. How would you detect the adulteration of Balsam of Copaiba with Castor Oil ?

6. Enumerate the principal Cathartics. In how many groups or orders may they be conveniently arranged ? What are the peculiar effects and uses of each group ?

STRUCTURAL AND PHYSIOLOGICAL BOTANY.

Examiner, Professor Henslow.

1. Compare a campanulate with a rotate corolla : and a corymbiform with an umbellate inflorescence. Illustrate your comparison by a slight sketch of each.

2. Whence does the Arillus originate ? Name two good examples of plants of different families in which it occurs.

3. How do you explain the formation of central and parietal Placentæ ? Name an example of each.

4. What is the nature of vegetable Albumen ? Is it found in the seeds of Ranunculus, Pisum, Sinapis, Primula, and Geranium.

5. What is a Stipule ? Are the plants in Rosaceæ, Leguminosæ, Cruciferæ, generally stipulate or not ?

6. How is the genus Cuscuta supplied with nourishment ? What peculiarity is observable in the structure of its embryo ?

7. What are " adventitious buds?" and how do you suppose they have originated ?

8.
9. } Describe these specimens.
10.

REMARKS ON MR. NOAD'S LETTER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—I REQUEST you to insert a few remarks on some only of Mr. Noad's statements, but which, I trust, will be sufficient to give your readers a correct idea of the value of the whole of his observations.

First. Mr. Noad makes the following assertion : "Now in my work, page 143, nothing is said about peroxide of manganese of good quality." Granted; but in page 142, and only four lines from that in which he mentions that nothing is said on the subject, occur these words, "the heat expels oxygen from the peroxide, a pound of which, if good, will be found quite sufficient to fill a gas-holder of the capacity of four gallons." Mr. Noad has therefore contrived a double subterfuge: he mentions a certain page as not containing a statement, as if I had asserted that it did, and he omits to name the page which does contain it, as if he had not made it at all.

Secondly. Mr. Noad quotes Dr. Kane's statement, that "an ounce troy," of chlorate of potash yields 543 cubic inches of oxygen gas, and in page 144 of his book, he says this salt "may be procured of any respectable Chemist, at about 9*d.* per ounce, so that two gallons of gas, almost pure, may be obtained for that sum." Now Mr. Noad knows perfectly well that the ounce purchased would be the avoirdupois ounce of 437½ grains, and *not* the troy ounce specified by Dr. Kane; and he also knows that it could *not* yield two gallons of oxygen gas as he asserts, but at most 497 cubic inches, instead of 554.

A similar stratagem is resorted to by Mr. Noad, with respect to the troy and avoirdupois pound of peroxide of manganese.

Thirdly. Mr. Noad asserts, that the quotation (page 140), "112 lbs. of charcoal require for combustion thirty-two cubic feet of oxygen, is a typographical error, the 1lb. having been mistaken by the printer for 112lbs." Here Mr. Noad, for an obvious reason, quotes himself incorrectly; in his book the passage is printed thus : "one hundredweight of charcoal requires for its combustion thirty-two cubic feet." It is certainly a curious circumstance if the printer mistook 1 lb. for 112 lbs. that he should have made another blunder on this subject, for he has *printed* "one hundredweight" in words, when he must have *read* 112 pounds in figures.

Fourthly, In page 202, Mr. Noad observes, "The following remarks are made by Liebig: 'One man consumes by respiration 24.8 cubic feet of oxygen in 24 hours, and 10 cwt. of charcoal consume 32 cubic feet.'" Dr. Playfair's translation gives, "10 centners of charcoal consume 58,112 cubic feet of oxygen during its combustion." Taking the quantity, as Mr. Noad has done, at ten hundredweight English, and adopting his altered statement, that one pound of charcoal consumes thirty-two cubic feet of oxygen, it follows that ten hundredweight will consume 35,840 cubic feet. Now whether the printer *read* thirty-two instead of thirty-five thousand eight hundred and forty, or Mr. Noad *wrote* thirty-two cubic feet instead of thirty-five thousand eight hundred and forty, I have no means of ascertaining. We may as well, however, lay the blame on the printer as before.

Fifthly, Making still further use of the printer in the explanation of difficulties, I think it will appear, that he could not only alter a sentence, but add or omit one; and that he could do this even in the same quotation. This supposition will account for much which *is found* in Mr. Noad's publication, and also for much which *is not.* I shall elucidate these positions by quoting one passage from among many which might be selected. In p. 133, the following is given as a quotation from Graham : the words which have been

added I have bracketted, and those which are omitted I have given in italics. "The atom of chlorine [gas] is 35.5 times heavier than that of hydrogen [gas], *and chlorine gas is also* 35½ *times heavier than hydrogen gas;* so that the combining measures of these two gases, which correspond with single equivalents, are necessarily equal."

Sixthly, I would further suggest, that the printer has omitted Mr. Noad's acknowledgment, that the long note in p. 202 of his lectures is not original, but translated from p. 26 of the *Essai de Statique Chimique* of M. Dumas. I will also venture to surmise, that the printer has totally neglected Mr. Noad's statement to the following effect: "Of the 106 woodcuts with which my Lectures on Chemistry are illustrated, six may be considered as original, 30 are derived from various authors, and 70 are copied from the works of Brande, Graham, and Kane."

In concluding, I have only to add, that Mr. Noad must excuse me for thinking, that until the numerous errors which he or the printer, or both, have committed, are rectified, no one who is intimately acquainted with the science of which he treats, will venture to say of his Lectures on Chemistry, what he himself modestly declares with respect to his Lectures on Electricity: this "little work I can confidently recommend to the notice of the general reader."—*Lectures on Chemistry*, p. 139.

I am, Sir, your obedient Servant,

The Author of the Review of Mr. Noad's Lectures on Chemistry, in the Philosophical Magazine.

NOTICES OF BOOKS RECEIVED.

PULMONARY CONSUMPTION SUCCESSFULLY TREATED WITH NAPHTHA. By JOHN HASTINGS, M.D., Senior Physician to the Blenheim Street Free Dispensary. 8vo, pp. 120. *London: John Churchill, Princes Street, Soho.*

PRACTICAL DIRECTIONS *for the Preparation of* AERATED WATERS, *and the various Compounds of Carbonic Acid Gas, by Bakewell's Patent Apparatus, with Observations upon the Pharmaceutical and Therapeutical Agencies, and their Efficacy in the Cure of some of the most important Diseases of the Human Body, viz., Indigestion, Phthisis, Nervous Atony or Mental Depression, Diseases of the Genito-urinary Organs, &c.* With Cases in Illustration. Pp. 108. By ROBERT VENABLES, A.M., M.D. *London: Published by George Knight and Sons, Foster Lane, Cheapside.*

ON the 8th of March, 1843, Mr. Knight exhibited at a meeting of the PHARMACEUTICAL SOCIETY the soda-water apparatus, of which a figure and description will be found in this Journal (vol. ii., p. 69). The above pamphlet contains full and explicit directions for using this apparatus in a very great variety of cases.

TRIAL.—*Court of Common Pleas, July 11th and 12th.*

JONES AND WALTON *v.* SAMUEL AND WM. THOS. BERGER.

MANUFACTURE OF RICE-STARCH.

WE now proceed to fulfil the promise made in our last number, to lay before our readers some particulars respecting an action brought by Jones and Walton against Messrs. Berger for an infringement of a patent for the manufacture of rice-starch.

In 1840, Mr. Orlando Jones took out a patent for the manufacture of starch from rice and other farinaceous substances. Though it had been long known that more starch* was contained in this grain than in wheat, yet until after the publication of Mr. Jones's process, rice-starch was unknown in commerce, and we believe that manufacturers were unacquainted with any method of economically extracting it; for the process which is usually followed in the manufacture of wheat-starch fails when applied to the preparation of rice-starch. To what circumstance this failure may be owing, is not very clear, but it is usually ascribed to some difference in the fermentation which these two grains respectively undergo when reduced to powder and placed in water: the fermentation of rice being more of a putrefactive character than that of wheat, and yielding less acetic acid to dissolve the gluten.

Mr. Jones's process consists in digesting rice in a solution of caustic alkali (soda), by which the *gluten*† is dissolved and removed, leaving an insoluble matter composed of *starch*, and a white substance technically called *fibre*. As the last mentioned substance falls more quickly than starch, when both are suspended in water, these two bodies are separated from one another by elutriation.

According to information furnished by the late Mr. Orlando Jones‡ to Dr. Pereira, it appears "that in manufacturing rice-starch on the large scale, Patna rice yields 80 per cent. of *marketable starch*, and 8.2 per cent. of *fibre*, the remaining 11.8 per cent. being made up of *gluten*, *gruff* or *bran*, and a small quantity of *light starch* carried off in suspension by the alkaline solution."

In the specification of his patent, Mr. Jones states that he claims as his invention "the mode of treating or operating on farinaceous matters to obtain starch and other products, especially the flour or powder produced from rice, and in the manufacture of starch by submitting farinaceous matters to a process or processes of caustic alkaline treatment, as herein described."

The alkaline solution employed contains 200 grains of real soda in every gallon of liquor, and as 150 gallons of liquor are used in the conversion of 100 pounds of rice into starch, it follows that 30,000 grains, or 4lb. 4oz. and 250 grains avoirdupois of soda are employed.

It is not necessary to enter into minute details respecting this process. It will be sufficient to state that 100 pounds of rice are macerated for from twenty to twenty-four hours in fifty gallons of the alkaline solution and afterwards washed with cold water, drained, and ground. To 100 gallons of the alkaline solution are then to be added 100 pounds of ground rice, and the mixture stirred repeatedly during twenty-four hours, and then allowed to stand for about seventy hours to settle or deposit. The alkaline solution is to be drawn off, and to the deposit cold water is to be added for the double purpose of washing out the alkali and for drawing off the starch from the other matters. The mixture is to be well stirred up and then allowed to rest

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* Braconnot obtained from Carolina rice 85.07, and from Piedmont rice 83.8 per cent of starch. Vogel procured from a dried rice no less than 96 per cent. of starch.

† On the addition of an acid to the alkaline solution, the gluten is precipitated, and may be used for alimentary purposes. (See Dr. Pereira's *Treatise on Food and Diet*, page 332).

‡ Mr. Jones, the patentee, died a few weeks before the trial came on.

about an hour for the fibre to fall down. The liquor holding the starch in suspension is to be drawn off and allowed to stand for about seventy hours for the starch to deposit. The waste liquor is now to be removed, and the starch stirred up, blued (if thought necessary), drained, dried, and finished in the usual way.

The above will enable our readers to understand Jones's process, the patent for which was taken out on the 30th of April, 1840, and enrolled on the 30th of October of the same year.

It appears that, subsequently to the enrolment of his patent, Mr. Jones discovered that part of his process was not new or original; but had been previously adopted by Mr. Thomas Wickham,* who, in 1824, took out a patent for "an improved and prepared rice, rendered applicable for use in all cases in which starch is applied," which he prepared by means of a solution of caustic potash. Wickham digested the rice in the grain in the solution, afterwards washed it with water, then immersed it in water, acidulated with sulphuric acid, and subsequently dried and ground it to flour, in which state it was to be used.

It is obvious, that Wickham's process anticipated Jones's, in the use of the caustic alkaline solution; and hence Jones found it necessary to disclaim, as part of his invention, any right to the process of "subjecting rice, previous to crushing or grinding the same into flour, to a caustic alkaline solution." Now, the essential difference between Jones's patent (after the disclaimer) and that of Wickham's is, that the latter, subjected *whole* rice to the action of the caustic alkaline solution; whereas Jones used *ground* rice. This difference, trivial as it may appear, greatly modifies the product; for, while Jones's process yields starch, properly so called, the product obtained by Wickham's process is, strictly speaking, rice-flour, deprived of part of its gluten and some of its fatty matter. Thus, for example, the substance, which is technically termed "fibre," is not at all removed by Wickham's process. In fact, Wickham did not pretend to call it starch. It is obvious, therefore, that Jones's product would be very considerably purer than that obtained by Wickham's process. Moreover, Wickham's patent applies to caustic potash only, whereas Jones's includes the caustic alkalies generally.

We now come to Mr. William Thomas Berger's patent process, which constitutes the ground of the present trial. In 1841, this gentleman took out a patent for "Improvements in the manufacture of Starch." In the specification, which was enrolled on the 24th day of December, 1841, several modes of manufacturing rice-starch, as well as one of blueing starch, are stated; but the process which formed the subject of this trial, is the third part of his invention, which "relates to a mode of manufacturing starch from rice, by the combined application of an alkaline salt with a process of fermentation." The rice, which has been fermented to a pulpy state, is then macerated, for from fifty to sixty hours, in a solution of "carbonate of soda †," stirring well once in every four hours. For 112 pounds of rice, a solution of seven pounds of carbonate of soda in three and a half gallons of water is used. The mixture is well stirred for half an hour, and is then allowed to remain for fifty or sixty hours, stirring every four hours. It is afterwards to be left without stirring from twelve to eighteen hours, for depositing, when the top discoloured liquor is to be drawn off. The bulk is now to be well stirred up, and made thin with 224 gallons of water to every 112 pounds of rice, then pumped through the separating vat, and finished in the usual way. If the product of any of the above processes, after washing, indicate

* In 1768, a Mr. William Prince took out a patent for the manufacture of rice-starch, by means of "a strong menstruum" [*lime-water*] made "from calcined oyster-shells or lime," and boiling water. It does not appear, however, that he either did or could make rice-starch, strictly so termed, by this process.

† It is not stated whether the carbonate is crystallized or anhydrous.

spontaneous fermentation, one ounce of sulphuric acid*, diluted in one gallon of water, is to be added to every 112 pounds of rice.

It was contended by the Plaintiffs that the use of carbonate of soda, in the manufacture of starch, was an infringement of Jones's patent; inasmuch as the power which a solution of this salt possesses of dissolving gluten depends on the alkalinity of the salt, and is derived from the alkali which it contains; and in proportion as the alkali is combined with carbonic acid so is its power of dissolving gluten impaired. Thus while the caustic alkali readily dissolves gluten, the carbonate has a much feebler power, and the bicarbonate very little if any. Hence the Defendant used a stronger solution of the carbonate to make up for its weaker power. Jones employs a solution containing 200 grains of soda in each gallon, while Berger uses a solution containing in every gallon, 14,000 grains (2 pounds) of carbonate of soda, in which are 3111 grains of real soda. In other words, the quantity of real soda contained in Berger's solution is about fifteen times that in the liquor used by Jones. Moreover, it was contended that even in the form of this very concentrated solution, carbonate of soda dissolves very considerably less of the gluten than the weaker solution of caustic soda; and, therefore, very imperfectly effected the separation of the other matters from starch; and that the starch made by Berger's patent was inferior to that made by Jones's, as it contained the greater part of the gluten, and was discoloured. Furthermore, as the term carbonate or subcarbonate of soda is frequently applied to a substance also called *soda ash*, which contains quantities of caustic or free soda varying from two or three up to thirty per cent., the Defendant could covertly use caustic soda under the name of carbonate.

The Defendants, on the other hand, contended that since Jones limited himself exclusively to the use of caustic alkali, the use by them of carbonate of soda (an alkaline salt) was not an infringement of his patent, for caustic alkalies and alkaline salts were perfectly distinct and different substances. Moreover, though they used a stronger solution than Jones, they employed a much smaller quantity of it. And the actual quantity of soda (contained in the carbonate) used by them in the conversion of 100 pounds of rice into starch, was actually only about one-third that employed by Jones. If, then, the carbonate of soda owed its efficacy to the alkali which it contained, the solvent power of which for gluten was diminished by combination with carbonic acid, how was it that Berger used so much less soda than Jones? For to convert 100 pounds of rice into starch, Jones used 30,000 grains of soda, while Berger employed only 9722 grains †.

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* Oil of vitriol (a compound of sulphuric acid and water) is probably meant.

† In court it was assumed that the quantity of real soda employed by Berger was about one-third that used by Jones. The number of grains stated in the text we have determined by calculations founded on the respective patents. Thus, Jones uses 30,000 grains of real soda to every 100 pounds of rice, while Berger employs seven pounds of carbonate of soda for every 112 pounds of rice, equal to 49,000 grains, or about six pounds and a quarter of carbonate to 100 pounds of rice. But 144 parts of crystallized carbonate of soda contain only thirty-two parts of soda: hence 49,000 grains of the crystallized carbonate contain only 9722$\frac{1}{4}$ grains of real soda.

In this specification, however, Berger does not use the term *crystallized* carbonate of soda, but simply carbonate of soda. Hence if we make our calculation on the assumption, that the compound which he intended to use contained only carbonic acid and soda, it follows that the relative proportions of soda used in the two patents, would be very different to that stated in the text—for 54 parts of carbonate of soda contain 32 of real soda: hence 49,000 grains (seven pounds) of carbonate contain 29,037 grains of real soda —a quantity which very nearly agrees with that used by Jones.

Moreover, the Defendant pleaded that Jones was not the first and true inventor of the process which he claimed, the same having been published in the specification of Wickham's patent, as well as in that of Prince's patent; to both of which patents we have before adverted. It was not, however, proved that starch could be made by either of these patents; on the contrary, it was proved on the part of the Plaintiffs that it could not.

The Jury found for the Defendants; thus declaring that the latter had not infringed the Plaintiffs' patent, and also that the Plaintiff was not the real inventor of the process. It is understood that the Plaintiffs intend to move for a new trial.

The result of this trial is another illustration of the uncertainties of the law, more especially of that which relates to patents.

The alkaline carbonates (monocarbonates) possess, as all our readers well know, an alkaline property, similar to, though feebler than the caustic alkalies; and if any person having the slightest knowledge of chemistry were informed that a solution of caustic alkali of a given strength would dissolve gluten without affecting starch, he would almost immediately conclude that the alkaline carbonates possessed a similar though feebler power. Hence, therefore, the substitution of the latter by the Defendants; for the caustic alkali used by the Plaintiffs appears to us to be a *moral* or *equitable*, though it may not perchance prove a *legal*, infringement of Jones's patent.

But why, it may be asked, did Jones omit to include the alkaline carbonates in his patent? Was he ignorant of their alkaline and solvent properties? or did he for some reason purposely and knowingly exclude them? We have been assured that he omitted them at the suggestion of Sir Frederick Pollock. It appears that prior to the enrolment of his specification, Jones was confidentially assisted in his experiments by Mr. Everett, the Lecturer on Chemistry at the Middlesex Hospital, who attended, with Mr. Jones and his solicitor, at several consultations with the present Attorney-General (Sir Frederick Pollock) on the settlement of the specification. Mr. Jones, finding that the alkaline carbonates had the power of dissolving gluten, though in a feebler degree than the caustic alkalies, suggested, as did also Mr. Everett, the propriety of introducing some general words into the specification, which should include these salts as well as the alkalies; but his suggestion was overruled by Sir Frederick, who observed that the Plaintiff was bound to give the public the best process, and that the law would protect him from the use of an inferior one. Accordingly Jones, acting under Sir Frederick's advice, omitted the alkaline carbonates from his specification; and to this omission may be referred the present lawsuit and its consequences.

At the trial Sir Frederick Pollock appeared for the Defendants, and to his talents they are mainly indebted for the verdict they have gained. But why, the reader will ask, did not the Plaintiffs secure the services of Sir Frederick at the trial, and thereby put him in a position to prove the safety and propriety of the advice which he had given, in the preparation of the specification of the patent, and which Jones had followed? Why allow him to be engaged by the Defendants to upset the patent which he himself had settled? The reply to these queries furnishes a curious illustration of legal etiquette.

It appears that Mr. Jones, immediately after the enrolment of his specification, gave general retainers to Sir Thomas Wilde, Sir Frederick Pollock, and Sir William Follett. Having afterwards taken Mr. Walton into partnership, it became necessary to include the latter as one of the Plaintiffs in this action, which was advised by Sir Frederick Pollock, on a written case submitted for his opinion. The Plaintiffs hence considered that they had secured his services on the trial; but being informed, in February last, that the Defendants had offered him a retainer, the Plaintiffs sent Sir Frederick his fees on his brief, and for a consultation, and a retainer, (amounting,

we understand, to about eighty guineas), notwithstanding which, he, a few days before the trial, took a brief against them, on the ground that he had been retained for the Plaintiff in the cause of Jones *v.* Berger, not in that of Jones and Walton *v.* Berger. He, therefore, returned the Plaintiffs their fees ; and with a knowledge of their case confidentially submitted to him, argued against the validity of the specification which he himself had settled, and in opposition to the action which he had advised.

We leave our readers to form their own opinions respecting the morality of this transaction ; but we are informed that it is in strict compliance with the usage and etiquette of the bar ! !

TO CORRESPONDENTS.

J. N.—" A few Associates employed in a wholesale house, who cannot attend the morning lectures, wish to know if the Council would make arrangements for the delivery of Evening Lectures, if a sufficient number could be found to form a class ; and suggest, if the Council be willing to make the arrangements, that an advertisement appear in the Journal, requesting those who would like to join to send their names to the Secretary."

[We have no doubt that if a sufficient number would send in their names, the Council would be glad to make some arrangement.]

H. Gale.—*Maw Seeds* are the seeds of a variety of the garden poppy (Papaver somniferum). They are cultivated in some parts of the world as oil seeds.

J. R.—The mode of preparing Donovan's liquor of hydriodate of arsenic and mercury, is described in this Journal, vol. ii, page 469.

" Inquisitor."—*Oleum Viride* is made with common rape oil and elder leaves, boiled until the leaves are crisp. It is sometimes called oil of swallows, oil of cabbage, oil of St. John, &c., &c.

" Aurim." On adding Liquor Plumbi Diacetatis to distilled water, a slight opalescence is observed, and with access of air this may increase so as to constitute a precipitate of carbonate of lead. See also page 110.

" A Member," Plymouth.—See vol. i, page 599.

MNO informs us, that alum is frequently added to wheat at the flour-mills before it is ground.

" Lincoln."—The presence of *tannic acid* may be detected in an infusion of roses, by the addition of a solution of gelatine, which occasions a curdy precipitate. When the infusion is mouldy, the astringent property is impaired.

" Ajax" wishes to know what the crystalline deposit is, that is thrown down on adding carbonate of potash to a solution of oil of bitter almonds in proof spirit, a specimen of which deposit he has sent us for examination. We have examined this product and find it to be *benzoïne*, a substance isomeric with the pure oil of bitter almonds or hydruret of benzule. This substance was discovered by Robiquet, on adding an alkali to commercial oil of bitter almonds ; it is very speedily formed when caustic potash is used, less so with carbonate of potash, and still less speedily with bicarbonate. With the first of these it is obtained in yellow crystalline grains, with the last nearly colourless. The colour arises from impurity, from which it may be freed by dissolving it in boiling alcohol, and separating the crystals which form on the cooling of the solution. It is readily distinguished by the action of oil of vitriol upon it, which occasions a deep blue colour, passing to green, and ultimately to brown.

"GINGER" recommends, in making elder-flower water, to infuse the flowers in boiling water, and strain, then to distil the liquor. He also recommends, in making syrup of squills, to prepare the *acetum scillæ* with a smaller proportion of acid than the Pharmacopœia recommends, to dissolve the sugar in the remainder of the acid, and mix the two together.

"AMICUS," (Plymouth), has sent us a description of his method of taking specific gravities, which we had thought of publishing, but on examining it, we find there are two serious objections to it; first, that it involves more complicated manipulation than the ordinary method; and, secondly, that if strictly followed, the results would not be accurate.

"A YOUNG CHEMIST" (Pimlico).—See page 115.

We have already stated, in a former number, that the pink colour for show bottles is made by dissolving oxide of cobalt in solution of ammonia, The depth of colour will depend on the quantity of cobalt used. Oxide of cobalt is sold by most manufacturing Chemists.

MR. LEAY is referred to the above. Mr. Leay gives the following directions for making show colours:—*Green*, add bichromate of potash to the blue solution of sulphate of copper, with ammonia. *Yellow*, add nitrate of potash to solution of bichromate of potash. *Red*, a dilute solution of iodine with iodide of potassium. [This last would not be a very good red.]

"UNUS E NOBIS."—The communication has been received, but we see no reason for changing our opinion.

"CHEMICUS."—A coloured chart of chemical tests has been published by Medwin and Co., 8, Temple Street, Whitefriars.

"SPERO" (Cheltenham).—Lindley's Elements of Botany, price 10*s.* 6*d.*

W. M. G. and L. S. H.—Parnell's Elements of Chemical Analysis, price 10*s.* 6*d.*

"M. MINOR."—Chloride of Bromine may be formed, at common temperature, by transmitting a current of chlorine through bromine, and condensing the disengaged vapours by means of a freezing mixture. Turner's Chemistry, p. 314.

"SARZA."—Being altogether a *medical* question, we cannot offer an opinion.

"AMICUS."—We know of no authorized formula for Pil. Cochia. For the derivation of the name, see vol. iii. p. 48.

"SCRUTATOR."—De Vallenger's Mineral Solution, is sold at Apothecaries' Hall; it contains chloride of arsenic, but we have not been able to obtain the formula.

T. C.—Elder-flower water does not generally become sour within a few days of its distillation, unless it happen to have been kept in a foul bottle or can. A second distillation would be of no use.

MR. BARTLETT, in reference to the Patent Medicine Licence, animadverts on the facts, that the same amount is paid by the wholesale and retail dealer for a licence; and that although the demand for patent medicines is much greater in the country than in London, yet the charge for the licence is less.

G. C. B. should furnish evidence, and authenticate his information with his name, otherwise it is of no value.

J. W. wishes to have the formula for Unguentum Lipitudinis.

"ALFRED," A.P.S. wishes to have formulæ for effervescing Cheltenham Salts and Moxon's Aperient Magnesia. Blue Ink is made by adding Prussian Blue to a solution of oxalic acid.

G. P. T. H.—The expense of walking the Hospitals is about £120, exclusive of board and lodging.

A. P. S. suggests, that the Winter Courses of Lectures should commence at half-past seven in the morning, in order to ensure a good attendance, especially from those who reside at a distance, and whose duties oblige them to return at nine or soon after.

"Amator Scientiæ" is eligible to become an Associate on passing the Minor Examination. See vol. ii. p. 481.

"Amicus," having commenced business on his own account, and having been an Associate before July 1, 1842, is eligible to become a Member and receive the diploma.

Several of our Correspondents will find Answers to their questions in the body of this number.

We had intended to insert, this month, the substance of a letter from Mr. Chippenfield, but are prevented doing so by want of space.

We have received two communications from Mr. Murray, of Hull. In one of these he lays claim to priority in the discovery of the fact, "that roots are excretory, as well as absorbing organs;" stating, that as early as 1818, he instituted a variety of experiments on bulbous and other roots, the result of which was at that time published, and received with some degree of scepticism, although it has since been confirmed, and is adverted to by Dr. A. T. Thomson, in the Pharmaceutical Journal, as a discovery of more recent investigators.

In the other communication, Mr. Murray states, that he was one of the first to employ hydrated peroxide of iron as an antidote for arsenic; and that his experiments "were communicated at the time to M. Orfila, and duly acknowledged."

We have received a communication from Mr. Gill, which is not adapted for our pages.

ERRATA.

At p. 71, six lines from the foot of the page, *for* 60° Fahr., *read* 122° Fahr.

In "Gmelin's Refutation of the Binar Salt Theory" (hypothesis), as quoted in our Review (vol. iii. p. 90, sixth line from the bottom) from the original work, there is a literal error, Hg_3 H, being printed for Hg_3 N. The passage should read: "but we must consider even ammonia H_3 N, which combines with several metallic oxides, as 3 Hg O, for example, to be metamorphosed into 3 H O and Hg_3 N; that is, into three atoms of water + three atoms of red oxide of mercury, associated with one atom of nitrogen."

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. IV.—OCTOBER 1st, 1843.

COMPETITION IN THE DRUG TRADE.

The sale of medicines by unqualified persons was mentioned, in our last number, as a source of unnatural competition, which occasions injury to the regular Druggist, and encourages the circulation of inferior drugs. We call this competition *unnatural*, because the parties concerned are not on an equality — those who have been educated to the business being undersold by others who are ignorant of the properties of drugs, and, therefore, comparatively indifferent respecting their quality.

We also pointed out the fact, that no remedy can be found for this evil; nor, indeed, have the Chemists and Druggists any right to complain of its existence, until they have established a distinction between themselves and the parties alluded to, by creating a *qualification* for the members of their own body.

The first thing to be done is to improve the education of the Chemists themselves—to raise their standard of proficiency, and enable the public to discover, by some obvious badge of distinction (besides the blue bottle), where genuine medicines are likely to be found, and in whose professional skill confidence may be placed.

The qualified Chemist is entitled to adequate recompense, not only for the labour of exercising his skill, but also for the labour which he has previously undergone in acquiring it. His time constitutes a portion of his capital; and its value must be estimated before the *cost* price of his goods can be correctly ascertained. In making this calculation, a variety of circumstances relating to the nature and peculiarities of his business must be taken into con-

sideration; but the hypothesis upon which all our arguments are founded is the presumption, that all the individuals composing the body are qualified. In order to make our hypothesis correct, we must defer the main argument for the present, and call the attention of our readers to the means by which alone the desired improvement in our character and position is likely to be effected.

THE SCHOOL OF PHARMACY

is the ladder by which we may hope to ascend to our proper place in the profession. The existence of such an institution is a practical demonstration of the fact, that our business is not merely a mechanical trade, but that it requires in those who follow it a certain amount of mental cultivation and scientific knowledge. That many members of our body are thus qualified we fully believe; but the nature and extent of the qualifications of each individual, as well as the means by which they have been acquired, are known only to himself. The branches of study with which the Pharmaceutical Chemist should make himself acquainted, have not until lately been clearly defined, and are not even now insisted upon. In fact, the only class of Pharmaceutists who are obliged by law to pass an examination in Pharmacy are the Apothecaries. The Chemists are left at liberty to use their own discretion in the matter; those who possess the means and the inclination to study their business as a profession, learn just as much as is convenient to each individual, and no more; others trust in the blue and red bottles, and all are classed together as Chemists and Druggists.

But this state of things cannot continue. The responsibility which rests on those who prepare and compound medicines is felt by the public; and the time must soon arrive in which the educated Chemist, who has made himself acquainted with the principles and science of his business, will no longer be confounded or classified with the Chandler, the Grocer, or the Oilman.

However humiliating it may be to acknowledge that imperfections exist among us, it must be a source of satisfaction to every one who feels interested in the credit of his profession, to reflect, that the whole of the operations which are now in progress for

the advancement of education in our body, emanate from ourselves. It must also be recollected, that whatever stigma may be thought to exist, cannot belong to those who are engaged in the work of improvement, but to the disaffected who are contented to remain stationary, while every other class of men is advancing with the times. And since we have every reason to believe that a very large proportion of our number cordially unite in the undertaking, and feel themselves identified in its results, it is not too much to expect, that all our members, in proportion to the opportunity within their reach, will co-operate in promoting the prosperity of the SCHOOL OF PHARMACY.

Some allowance must be made for the prejudices under which we have lived for a long series of years, in reference to the mode of conducting our respective establishments. The routine of ordinary domestic arrangements must not be neglected. The cleaning of windows, bottles, counters, &c., is as necessary as any other duty, and it may, in the first instance, appear inconvenient, and in some cases almost impossible, to disturb the usual order of proceedings for the sake of liberating young men to attend lectures. To those who live at a considerable distance from Bloomsbury Square, the difficulty increases in proportion. But when it is remembered that the information gained by the student during the hour of lecture in the morning, will conduce to the more correct performance of his duties during the day, the slight alteration in the arrangements which would be requisite, ought not to be considered an insurmountable obstacle. If this should involve the necessity of rising an hour earlier, the student would be amply rewarded for this additional industry, by the insight which he would gain into the more elevated and scientific details of his business. The expense of attending the lectures of the PHARMACEUTICAL SOCIETY is so inconsiderable, when compared to that which is incurred by students in other institutions, that the majority of our Associates need not be deterred on this account from participating in the benefit, since it cannot be supposed that a young man, whose parents could afford to give a premium of

200 or 300 guineas for his instruction in the mechanical operations of the business, could be unable to pay a guinea for a course of lectures by which the mind might be directed to perform those operations on correct scientific principles. In fact, those whose circumstances do not admit of the purchase of education at this very moderate rate, ought to choose some other line of business, instead of continuing in one which they unfortunately have not the means of following creditably. However desirable it may be to pursue the different branches of study at the same period of time, and thus to perceive the connexion between the sciences, this may not, in all cases, be practicable: those who are unable to attend two or more courses of lectures during the same session, must be content to take up one subject at a time; and the extent to which individuals avail themselves of these advantages, must of course depend upon their respective circumstances and position.

If it be asked how the establishment of a few courses of lectures in the metropolis can influence, or benefit the body at large, we may make the same enquiry with respect to every other profession, in which similar facilities for improvement exist in certain localities. In every institution, there must be a nucleus from which all the proceedings emanate. It is not intended to confine these measures to the metropolis. Steps have already been taken for establishing branch schools in some large towns, where capabilities for effecting this object appear to exist; and if the institution should meet with that encouragement which it deserves, its benefits will be still further extended. The reputation of the Society can only be maintained by the energy with which these proceedings are conducted. The examinations, the scientific meetings, the library and museum, will tend no less than the lectures, to raise the qualification of our members, and thus to confer upon the body a degree of professional character. This credit will extend itself to all the members, and in course of time the diploma of the Society will constitute a badge of distinction, entitling the possessor to public confidence.

The Society of Apothecaries is located in London. The Examinations and other proceedings take place at the establishment,

yet every Member and Licentiate in whatever part of the country he may settle, exhibits the diploma of the Society as a proof of his proficiency, and enjoys increased reputation in consequence. Although the College of Surgeons is not protected by Act of Parliament, and the possession of the diploma of that body is optional, few, if any, respectable practitioners enter into practice as Surgeons without previously presenting themselves for examination at Lincoln's Inn Fields, for the purpose of gaining a distinction from which they derive professional character.

The Pharmaceutical Society, in this particular, resembles the College of Surgeons. Our Lectures and Examinations are not enforced by Act of Parliament, but the credit which belongs to the members of such an institution is not diminished by the voluntary nature of its constitution.

There is another circumstance which we ought not to forget—namely, that although our Society is at present a voluntary one, the whole medical profession, the public, and the legislature are united in the persuasion, that a proper qualification, in those who prepare and sell drugs, is absolutely necessary in a sanatory point of view. We may, therefore, anticipate that, sooner or later, some compulsory regulations, in reference to the education of our body, will be introduced in the form of an Act of Parliament.

It is also our firm belief, that a majority of our own body are anxious for the result which such regulations would produce. We are constantly receiving letters from members of the trade, suggesting the propriety of petitioning Parliament to restrain Grocers and other unqualified persons from encroaching on our department: but most of our correspondents appear to forget that the granting of such a petition would involve the necessity of at once establishing a distinction between the parties to be protected and the invaders of their prerogative ; which distinction could only be founded on individual qualification as tested by a regular examination.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE III.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
HONORARY MEMBER OF THE PHARMACEUTICAL SOCIETY.

[Continued from page 65.]

The doubly refracting structure is not inherent in the molecules themselves. Quartz or crystallized silica doubly refracts; but tabasheer, opal, and melted quartz, all siliceous substances, do not. Ice doubly refracts, while water singly refracts. What is the reason of this?

It will be generally admitted, I presume, that the double refraction of ice is a molecular property, and is associated with the shape of the atom; and hence, if the atoms of water have the same form as those of ice, they ought also to possess the doubly refracting property of the latter. Now, the advocates for the hypothesis of the unchangeability of atomic forms contend, that in ice the atoms are symmetrically and regularly arranged, with their axes pointing in the same direction; while in water they are unsymmetrically or irregularly arranged or jumbled together in such a manner that their axes have every possible direction, so as to create a general equilibrium of the polarizing forces. But, if this were the case, two specimens of water would scarcely ever present the same optical properties. If, by any accident, the axes of a large majority of the molecules should happen to be arranged in the same direction, the liquid would then possess a doubly refracting property. Now, it appears to me, that no hypothesis can be correct which ascribes to accident or chance a constant and invariable property of a body; for I hold, that, except when approaching the freezing point, liquid water is invariably a single refractor.

But on the assumption that the shapes of atoms are, to a certain extent, capable of change, the difficulty is easily obviated. Suppose the atoms of liquid water to be spheres, and that in the act of freezing they become spheroids, the expansion of water in the act of freezing, the doubly refracting property, and the crystalline form of ice would then be readily explicable.

A consistent explanation of Dimorphism can scarcely be offered except on the assumption of the changeability of the shapes of the atoms. Carbonate of lime, for example, crystallizes in two distinct and incompatible forms, the one belonging to the rhombohedric, the other to the right prismatic system. In

the first case, we call it Iceland-spar; in the other, arragonite. Iceland-spar has one negative optic axis, arragonite has two negative optic axes. The shapes of the atoms of these bodies must, therefore, be different. Admit that, under certain circumstances, the atom of carbonate of lime can change its shape, and all difficulty as to the production of these forms is at an end.

We suppose, therefore, that "when in the process of evaporation or cooling, any two molecules are brought together by the forces or polarities which produce a crystalline arrangement, and strongly adhere, they will mutually compress one another." If the compression in three rectangular directions be equal, the crystal will be a singly refracting one: if the compression in two directions be equal but different in the third, the crystal will be a doubly refracting one with one optic axis: and, lastly, if the compression be different in each of the three directions, the crystal will doubly refract, and have two optic axes.

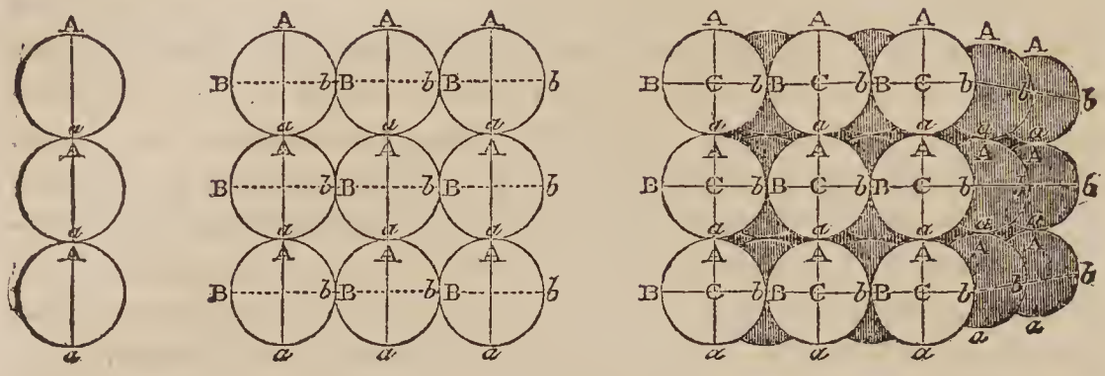
5. *Molecular Forces.*—Between the molecules of crystals, as well as of other bodies, there exist attractive and repulsive forces, in virtue of which the molecules are retained, not in contact, but within certain distances of each other. These forces are antagonists, and, therefore, the molecules acting under their influence, take up a position of equilibrium, where the two opposing powers counterbalance each other.

But in crystals it is necessary to admit, besides ordinary *attraction* and *repulsion*, a third molecular force called *polarity*, which may be regarded either as an original or a derivative property. Without this it is impossible to account for the regularity of crystalline forms. Under the influence of a mutually attractive force particles would adhere together and form masses; the shapes of which, however, would be subject to the greatest variety; and though occasionally they might happen to be regular, yet this could not constantly be the case.

The simplest conception we can form of polarity is, that it depends on the unequal action of molecular attraction or repulsion in different directions. A molecule endowed with unequal attractive forces in different directions may be said to be possessed of polarity.

A crystal has length, breadth, and depth or thickness. It is composed of molecules accumulated in three different directions corresponding to these three measurements; and it is obvious, therefore, that to account for their cohesion we must suppose that they attract each other in three directions; moreover, as the relative intensity of their attraction in these directions is, in many cases, unequal, it might be even supposed that they are three different kinds of attractions. To render this subject intelligible I shall make use of some illustrations employed by Dr. Prout in one of the Bridgewater Treatises.

FIG. 24. FIG. 25. FIG. 26.



Suppose three molecules to adhere together to form a single *row*, line, or string of molecules, in virtue of an attractive force which I shall distinguish by the name of the *length force*. The points *A A A* or *a a a* are supposed to mutually repel each other, while *Aa Aa Aa* mutually attract (fig. 24).

Let us further suppose that three such rows of particles cohere in virtue of an attractive force acting in a direction perpendicular to the first. We may distinguish this as the *breadth force*. The points *B B B* or *b b b* are supposed to mutually repel, while *Bb Bb Bb* mutually attract. These three rows of particles by their cohesion form a *plane* (fig. 25).

Again let us assume, that three such planes cohere together, in virtue of an attractive force acting in a direction perpendicular to both the other forces. This force we may denominate the *depth force*. The points *C C C* or *c c c* are assumed mutually to repel, while *Cc Cc Cc* mutually attract. These three planes by their union form a *solid* (fig. 26).

Thus, then, we suppose that the molecules of crystals have three rectangular axes of attraction, or "lines along which they are most powerfully attracted, and in the direction of which they cohere with different degrees of force."

Though for convenience and facility of explanation I have employed the terms length-force, breadth-force, and depth-force, I by no means wish you to suppose that I adopt the notion of the distinct nature of these forces. They may be, perhaps they are, one force acting in three directions.

These forces may be *equal* or *unequal*, and in the latter case two only, or all three, may be unequal. That is, in some crystals the length-force may be equal to the breadth-force, and this to the depth-force. Or two only of the forces may be equal, the third being unequal: or, lastly, all three may be unequal.

As I have already had frequent occasion to speak of the *elasticity* of crystals, and as I shall again have to refer to it, I think it proper to explain what is meant by it. I have stated that the molecules of bodies are not in actual contact, but are separated by greater or less intervals. They are kept from actual contact

to which attraction urges them, by repulsion, while their further separation is opposed by attraction.

Now we may disturb their state of equilibrium. We may, for example, by some compressing force, compel the particles to approach nearer to each other; but when the disturbing cause ceases to act, the particles after a few oscillations take up their original position. This then is what we mean by elasticity, which is obviously a consequence of attraction and repulsion. An elastic body is one which has the property of restoring itself to its former figure after any force which has disturbed it is withdrawn.

If by any force we approximate the particles of an elastic body, we augment its elasticity, and *vice versâ*. Now, as it is repulsion which opposes the approximation of particles, it appears that it is this force principally which confers on bodies the property called elasticity.

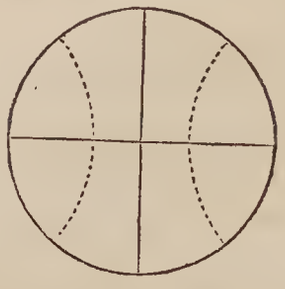
In some crystals their elasticity is equal in three rectangular directions. Such crystals may be denominated *equielastic*. Others, however, have unequal elasticities in different directions, and may be termed *unequielastic*. The first are single refractors, the latter are double refractors. Of the unequielastic crystals, some have two of their three elasticities equal, others have all three of their elasticities unequal: the first may be termed *di-unequielastic*—the second, *tri-unequielastic*.

The elasticity in the crystallographical axis may fall short of or exceed that in other directions: in the first case, crystals are said to have a negative or repulsive axis, or an axis of dilatation; in the latter case, they are said to have a positive or attractive axis, or an axis of compression.

By experiments made by Savart*, on the mode of sonorous vibration of crystalline substances, it has been shown, that the negative or repulsive axis is the axis of least elasticity, while the positive or attractive axis is the axis of greatest elasticity. "In carbonate of lime," he observes, "it is the small diagonal of the rhombohedron which is the axis of least elasticity, whilst it is that of greatest elasticity in quartz." To be convinced of the accuracy of this assertion, it is sufficient to cut, in a rhombohedron of carbonate of lime, a plate taken parallel to one of its natural faces, and to examine the arrangement of its two nodal systems, one of which consists of two lines crossed rectangularly, which are always placed on the diagonals of the lozenge, the primitive outline of the plate; and the other is formed of two hyperbolic branches, to which the preceding lines serve as axes, (fig. 27), but with this peculiarity, that it is the small diagonal

* Taylor's *Scientific Memoirs*, vol. 1.

FIG. 27.



Nodal Systems of Calc Spar.

FIG. 28.

Ditto of Quartz.

which becomes the first axis of the hyperbola, whilst it is its second axis in the corresponding plate of rock crystal (fig. 28).

The following table shows the relation between the elasticities and shapes of crystals:

TABLE OF THE ELASTICITIES OF CRYSTALS.

		Systems.		
CLASS 1. Equielastic crystals ...		1. Cubic.		
CLASS 2. Unequielastic crystals ...	*Order* 1. Di-unequielastic..	2. Rhombohedric ...	Elasticity in crystallographical axis, either	*a.* Minus (negative or repulsive) or
		3. Square Prismatic		*b.* Plus (positive or attractive)
	Order 2. Tri-unequielastic..	4. Right Prismatic..		
		5. Oblique Prismatic		
		6. Doubly Oblique Prismatic		

Conclusions.—From the preceding remarks it will appear,

1. That *singly refracting crystals* are equiaxed, equiexpanding, equielastic, and, on the ellipsoidal hypothesis of molecules, may be assumed to be made up of spherical atoms.

2. That *doubly refracting crystals* are unequiaxed, unequiexpanding, unequielastic, and, on the ellipsoidal hypothesis of molecules, may be assumed to be made up of either spheroidal atoms or ellipsoids with three unequal axes.

3. That *uniaxial crystals* are di-unequiaxed, di-unequiexpanding, di-unequielastic, and, on the ellipsoidal hypothesis of molecules, may be assumed to be made up of spheroidal atoms.

4. That *biaxial crystals* are tri-unequiaxed, tri-unequiexpanding, tri-unequielastic; and, on the ellipsoidal hypothesis of molecules, may be assumed to be made up of ellipsoids having three unequal axes.

5. That doubly refracting crystals, having a *negative* or *repulsive axis*, expand more, and have less elasticity in the direction of the axis than in directions perpendicular to this.

6. Lastly, that doubly refracting crystals, having a *positive* or *attractive* axis, expand less, and have more elasticity in the direction of the axis than in directions perpendicular to this.

I shall now go through the six systems of crystals, separately pointing out the most important of their optical and other properties.

SYSTEM I.

THE CUBIC OR OCTOHEDRAL SYSTEM.

Synonymes.—The *regular*, the *tessular*, the *tesseral*, or the *isometric system.*

Forms.—The forms of this system are either *homohedral* or whole forms, or *hemihedral* or half forms.

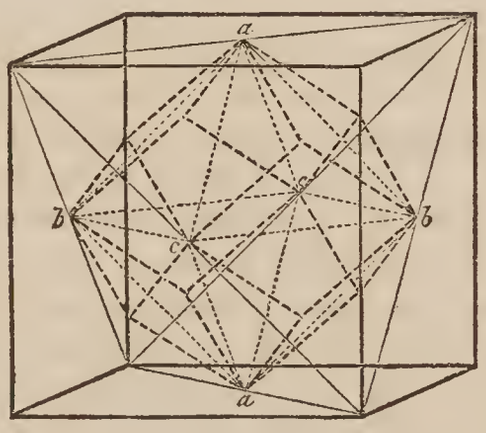
Homohedral Forms.

1. Regular Octohedron.
2. Cube or Hexahedron.
3. Rhombic Dodecahedron.
4. Icositetrahedron.
5. Triakisoctohedron.
6. Tetrakishexahedron.
7. Hexakisoctohedron.

Hemihedral Forms.

1. Tetrahedron or Hemioctohedron.
2. Hemicositetrahedron or Pyramidal Tetrahedron.
3. Hemitriakisoctohedron.
4. Hemihexakisoctohedron.
5. Hemitetrakishexahedron or Pentagonal Dodecahedron.
6. Hemioctakishexahedron.

FIG. 29.



Four forms of the Cubic System; viz., Cube, Regular Tetrahedron, Rhombic Dodecahedron, and Regular Octohedron.
a a, b b, c c. The three rectangular equal axes.

Crystals.—Of the fifty-five or fifty-six simple or elementary bodies which have been hitherto discovered, the crystalline forms of not more than eighteen have been ascertained. Of this number, no less than thirteen are referable to the cubic system, namely *bismuth*, *copper*, *silver*, *gold*, *platinum*, *iridium* (?), *iron*, *lead*, *titanium*, *mercury*, *sodium*, *phosphorus* and *diamond*. Now it appears *à priori* probable that simple bodies would have spherical atoms, and, therefore, the fact that the above-named substances crystallize in forms belonging to the cubic system, has been adduced as an additional evidence of their simple nature.

A considerable number of binary compounds also belong to this system — as the *chlorides of sodium*, *potassium*, and *silver*; *sal ammoniac*; the *bromide* and *iodide of potassium*; *fluor-spar*, and the *sulphurets of zinc* (blende), *lead* (galena), *silver*, and *iron* (pyrites).

Some substances, which contain more than two elements, also belong to this system, as *alum* and *garnet*.

Now, if the cubical form be an argument for the simple nature

of the metals, why, it may be asked, do so many compound bodies present the same form? To this we can offer no satisfactory reply; and I think, therefore, we may conclude with Dr. Wollaston, "that any attempts to trace a general correspondence between the crystallographical and supposed chemical elements of nature, must, in the present state of the sciences, be premature."

Properties.—The crystals of this system have the following properties: they are equiaxed singly refracting, equiexpanding and equielastic. We assume their molecules to be spherical.

When examined in the polariscope they present no traces of colour.

Exceptions.—A few exceptions exist to some of the preceding statements; but they are probably more apparent than real.

1. Several crystals of this system, as the diamond, fluor-spar, alum, and common salt, sometimes exhibit traces of a doubly refracting structure. But this is ascribable to irregularities of crystallization, or to the operation of compressing or dilating forces.

2. *Boracite* (a compound of boracic acid and magnesia) crystallizes in the general form of the cube; the edges of which are replaced, and the diagonally opposed solid angles dissimilarly modified. Instead, however, of being merely a single refractor, as its shape would lead us to expect, Dr. Brewster found that it was a double refractor, with one positive axis of double refraction in the direction of a line joining two opposite solid angles of the cube. So that, in point of fact, it possesses the properties of a rhombohedric crystal. We may, therefore, regard it as a rhombohedron, whose angles differ from a right angle by an infinitely small quantity.

3. *Analcime* or *cubizite* (hydrated silicate of alumina and soda) constitutes another remarkable exception to the general rule, that crystals of the cubic system are devoid of a doubly refracting structure. The most usual form of this crystal is the icositetrahedron. "Now if we suppose," says Dr. Brewster, "its contained cube to be dissected by planes passing through all the twelve diagonals of its six faces, each of these planes will be found to be a plane of no double refraction or polarization." All intermediate portions doubly refract. From every other known doubly refracting crystal, analcime differs in the circumstance, that all its particles do not equally possess the property of double refraction, those in the planes above mentioned being devoid of this power, and the others possessing it in proportion to the squares of their distances from these planes. It differs from unannealed glass in the fact that a change in its external form does not give rise to a change in its polarizing power; but each fragment possesses the same optical property, when it is detached from the mass, that it had when naturally connected with its adjacent parts. Analcime, therefore, is a complete optical anomaly.

It has been suggested, that these curious optical properties may depend on the presence of both a doubly and a singly refracting mineral; and the fact, that the large opake crystals of analcime, found in the valley of Fassa in the Tyrol, are traversed by plates of apophyllite (a doubly refracting crystal), lends support to this hypothesis.

SYSTEM II.

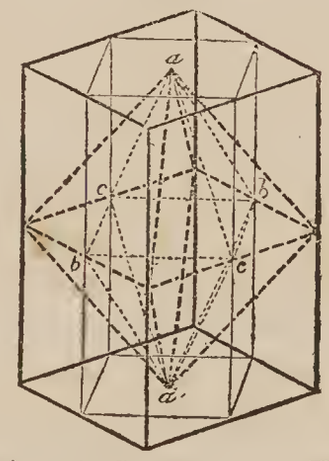
THE SQUARE PRISMATIC SYSTEM.

Synonymes.—The *four-membered* or *two- and one-axed*, the *pyramidal*, the *tetragonal*, or the *monodimetric system.*

Forms.—The forms of this system are either *homohedral* or whole forms, or *hemihedral* or half forms.

Homohedral Forms.	*Hemihedral Forms.*
1. Octohedron with square base.	1. Hemioctohedron or Tetrahedron.
2. Terminal Face or Horizontal Plane.	2. Hemi-dioctohedron.
3. Square Prism (of two positions).	
4. Dioctohedron or Eight-sided Pyramid.	
5. Eight-sided prism.	

FIG. 30.



Four forms of the Square Prismatic System; viz., Two Square Prisms in different positions, and Two Octohedra with square bases.
a a. Principal axis. *b b, c c.* Secondary axes.

Crystals.—Among the crystals * of this system are *chloride of mercury* (calomel), *bicyanide of mercury*, *ferrocyanide of potassium* (yellow prussiate of potash), *peroxide of tin*, *copper pyrites*, *zircon*, and *apophyllite.*

Properties.—The crystals of this system have the following properties: They are di-unequiaxed, doubly refracting with one optic axis, di-unequiexpanding, and di-unequielastic. We assume their molecules to be either prolate or oblate spheroids.

The two equal rectangular geometric axes of this system are called *secondary axes;* while the third or odd one, which may be greater or less than the others, is the *principal* or *prismatic axis*, or the *crystallographical axis*, or the *axis of symmetry.* The

* Sowerby (*Ann. Phil.* xvi. 223.) mentions crystals of *Palladium* in the form of octohedra with a square base and of symmetrical prisms.

optical characters of this system are the following: The crystals are doubly refracting, with one optic axis which coincides with the principal axis.

If a thin slice of a crystal of this system, cut perpendicularly to the principal axis, be placed in the polariscope, it presents a system of circular rings, with a cross, which is either black or white, according to the relative positions of the polarizer and analyzer.

Ferrocyanide of potassium (commonly called *prussiate of potash*) may be conveniently used to show these effects. As found in commerce it usually occurs in the form of truncated octohedrons having a square base. It should be split with a lancet in the direction of its laminæ, that is, perpendicularly to its principal axis. Plates, of about a quarter of an inch or more in thickness, serve for the polariscope. They present a cross, and a negative system of circular rings; but the yellow colour of the crystal affects the brilliancy of the tints.

Zircon (a compound of silica and zirconia) is valuable for optical purposes, on account of its being a *positive* uniaxial crystal. Hence if a plate of it, which gives a system of rings of the very same size as that produced by a plate of Iceland spar (a *negative* uniaxial crystal) be superposed over the latter plate, the one system of rings is completely obliterated by the other; and the combined system exhibits neither double refraction nor polarization.

I shall defer all explanation respecting the rings and cross of this system, until I speak of Iceland spar (a crystal of the rhombohedric system).

Exceptions.—Some exceptions to the above-mentioned properties of the crystals of this system exist, and require to be noticed.

1. *Ferrocyanide of potassium* is subject to irregularities of crystallization; and certain specimens present a double system of rings, or, in other words, are biaxial. Certain uniaxial specimens give a positive system of rings.

2. *Apophyllite* or *Fisheye-stone* (a compound of silica, lime, potash, and water) possesses some remarkable properties. In the most common variety, that from Cipit in the Tyrol, the diameters of the rings are nearly alike for all colours — those of the green rings being a little less. Some specimens of apophyllite, called by Dr. Brewster *tesselated apophyllite*, present, in the polariscope, a tesselated or composite structure, instead of the ordinary cross and circular rings. They will be described hereafter among the tesselated or intersected crystals.

SYSTEM III.

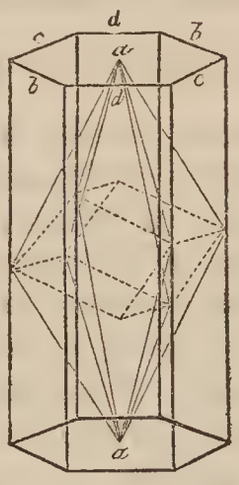
THE RHOMBOHEDRIC SYSTEM.

Synonymes.—The *three- and one-axed*, the *klinohedric*, the *hexagonal*, or the *trimetric system*.

Forms.—The forms of this system are either *homohedral* or *hemihedral*.

Homohedral Forms.	*Hemihedral Forms.*
1. Double Six-sided Pyramid (Hexagondodecahedron).	1. Rhombohedron (Hemidodecahedron).
2. Right Terminal Face (Horizontal Plane).	2. Scalenohedron.
3. Hexagonal Prism.	
4. Double Twelve-sided Pyramid (Didodecahedron).	
5. Twelve-sided Prism.	

FIG. 31.



Three forms of the Rhombohedric System; viz., the Hexagonal Prism, the Scalene Dodecahedron and the Rhombohedron.
a a. The principal axis. *b b, c c, d d.* The secondary axes.

Crystals.—To this system belong some bodies supposed to be simple or elementary; viz., *antimony*, *arsenicum*, and *tellurium.**

Plumbago or *graphite* and the *native alloy of iridium* and *osmium* also belong to this system.

Ice, *magnetic iron pyrites*, *cinnabar*, *chloride of calcium*, *Iceland spar*, *carbonates of iron and zinc*, *dolomite* (magnesian carbonate of lime), *nitrate of soda*, *hydrate of magnesia*, *tourmaline*, *talc*, *beryl*, *chabasite*, *quartz*, and *one-axed mica* belong to this system. And here it may be necessary to remark, that the substance known to mineralogists by the name of *mica*, and which, in trade, is usually but improperly termed *talc*†, varies in its crystalline forms and optical properties. One kind crystallizes in regular hexagonal prisms, which cleave with extreme facility in one direction, viz., perpendicularly to their axis. This has only one axis of [no] double refraction, and consequently when a lamina of it is placed in the polariscope it presents only one system of circular rings traversed by a cross. This is the kind called *rhombohedral* or *uniaxial mica*, the majority of specimens of which have a negative or repulsive axis, though some have a positive or attractive one. But there is another kind of mica, of more frequent occurrence in the shops, and which is called by mineralogists *prismatic* or *diaxial mica*. It has two

* Rose inserts "*Palladium* (?)" among rhombohedric crystals.

† Talc is readily distinguished from mica by its greasy or unctuous feel. The most familiar kind of talc is that sold in the shops under the name of *French chalk*. It is talc in an indurated earthy form.

axes of double refraction, and consequently when a plate of it is placed in the polariscope, two systems of coloured rings are perceived. This kind of mica exists in two forms; one is crystallized in right prisms, the other in oblique prisms. Hence I shall distinguish the one as *right prismatic mica*, the other as *oblique prismatic mica*. They will be described hereafter. In conclusion, then, the kinds of mica may be thus arranged:

Mica ..... { Rhombohedric or Uniaxial { With a negative axis, or / With a positive axis. / Prismatic or Diaxial ..... { Right Prismatic. / Oblique Prismatic.

The principal constituents of mica are silica and alumina. But it also contains potash and sesquioxide of iron.

Properties.—The forms of this system possess four axes†; viz., three equal ones, called the *secondary axes*, placed in one plane, and crossing in the centre at an angle of 60°; and a fourth, termed the *principal axis*, or the *axis of symmetry*, or the *crystallographical axis*, perpendicular to the others, from which it differs in length. They are double refractors, with one optic axis coincident with the principal axis. They are di-unequiexpanding bodies, the expansion being different (greater or less) in the principal axis from that in the secondary ones. They are di-unequielastic; the elasticity in the principal axis being either more or less than that in the secondary axes. With regard to the atoms, we may assume their shape to be spheroids.

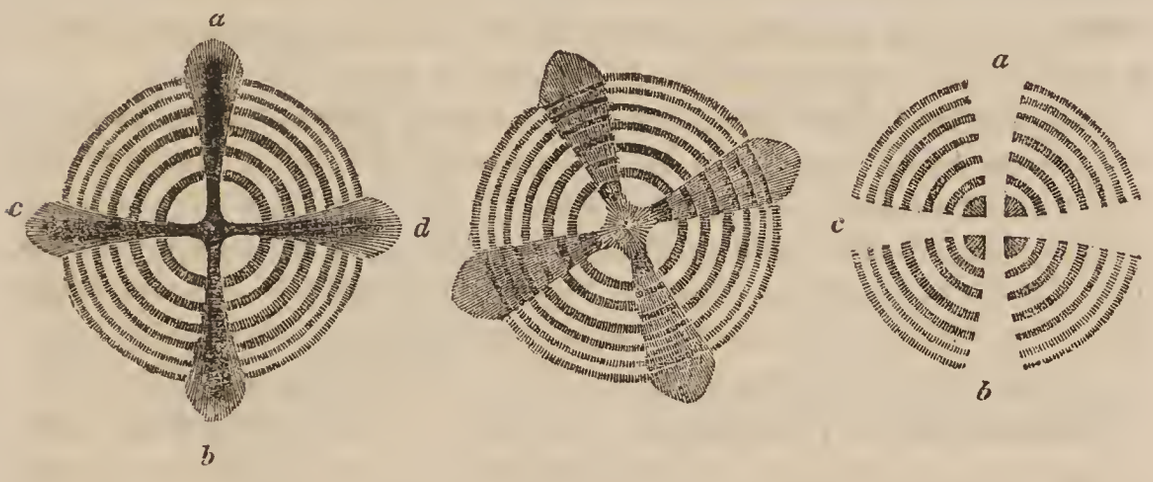
Iceland spar (Ca O. CO_2) may be conveniently used to illustrate the optical properties of the crystals of this system. It occurs in rhomboidal masses, which by cleavage yield obtuse rhombohedra. The line which joins the two obtuse summits of one of these rhombohedra, is called the *shortest* or *principal axis*, the *crystallographical axis*, the *axis of the rhomboid*, or simply the *axis*. A plane drawn through this axis, perpendicularly to a face of the crystal, is called the *principal section*. This section belongs rather to a face than to the entire crystal, for each face has its own. Now when the incident rays are perpendicular to the face of the crystal, both the ordinary and extraordinary rays are always found in the same plane, so that the deviation of the extraordinary pencil takes place in the plane of the principal section. Every plane in the interior of the crystal, which is perpendicular to the axis, is called a *section perpendicular to the axis*, or the *equator of double refraction*. In this plane the

† The description adopted in the lectures is that of Weiss and Rose; some other writers admit only three axes. Thus, Turner (*Elements of Chemistry* 7th ed., p. 588) describes three equal but not rectangular axes; while Griffin (*System of Crystallography*, pp. 151 and 258) admits three rectangular but unequal axes. Neither of these modes of descriptions appear to me so completely to connect the form with the optical and other properties of the crystals, as Weiss and Rose's method.

doubly refracting force is at a maximum, and when a ray is incident in this plane, the resulting extraordinary and ordinary rays are both in the same plane.

If a plate of Iceland spar, cut perpendicularly to the principal or shortest axis, be placed in the polariscope, the polarizing and analyzing plates being crossed, we observe coloured curves or concentric rings intersected by a rectangular black cross, the arms of which meet at the centre of the rings (fig. 32).

Fig. 32. Fig. 33. Fig. 34.



The coloured curves or rings are called *the lines of equal tint*, or *isochromatic lines* (from ἴσος *equal* and χρωματικὸς *coloured*). In this and other uniaxial crystals, they are disposed in concentric circles, and are similar to Newton's rings seen by reflection.

If we revolve the plate of Iceland spar on its axis, the rings and cross preserve the same position; but if either the polarizing or analyzing plate be rotated, some remarkable changes occur.

Suppose the analyzing plate to be turned 45° round the incident ray in a left-handed direction, we observe that the original or primary coloured rings grow fainter or more dilute, and the cross seems to shift its position to the left, while its blackness lessens and is replaced by another set of rings, which alternate with, and are complementary to, the original curves (fig. 33).

If the analyzing plate be rotated 45° further in the same direction, that is 90° to the first or original position, the black cross is replaced by a white one, and the original set of coloured rings is succeeded by a second or complementary set, the rings of which are intermediate to the original ones, and are similar to Newton's rings seen by transmission (fig. 34).

If the system of rings with a black cross (fig. 32) were superposed in the system with the white cross (fig. 34) white light would be reproduced.

If the incident polarized light be white, the rings consist of compound tints produced by the superposition on each other of rings formed by each of the homogeneous rays composing white light.

Of course, if the rings of all the colours were of the same size, the resulting system would consist of black and white rings; but being of different dimensions, we obtain a system of different colours. In this case, the cross is either black or white, not coloured.

If the incident polarized light be homogeneous the rings consist of rings of the colour of the light employed separated by black rings. Thus, suppose red light to be used, the rings will be alternately red and black; whereas if blue light be employed, they will be alternately blue and black. Their size varies with the colour of the light: red produces the largest, violet the smallest system of rings. In all cases in which homogeneous light is employed the cross is either a black or a coloured one.

The radii of the bright rings are as the square roots of the odd numbers, 1, 3, 5, 7, &c.; while those of the dark rings are as the square roots of the even numbers, 2, 4, 6, 8, &c. In other words, the squares of the diameters of the bright rings are as the odd numbers, 1, 3, 5, 7, &c.; while the squares of the diameters of the dark rings are as the even numbers, 2, 4, 6, 8, &c.

Squares of the diameters of the ...	*Bright* rings	1	—	3	—	5	—	7	—
	Dark rings	—	2	—	4	—	6	—	8

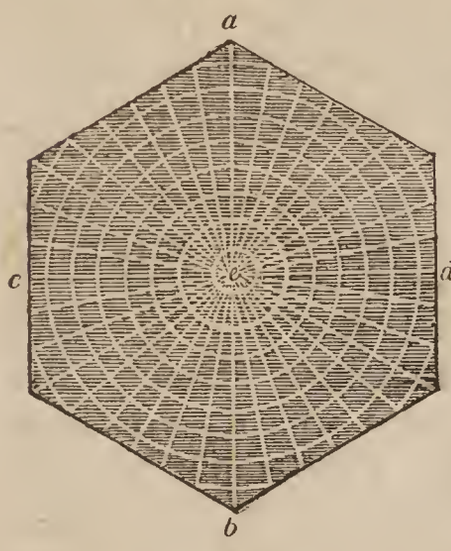
The actual diameter and breadth of the rings are increased by diminishing the thickness of the crystalline plate. To speak more precisely, the radii of the rings are inversely as the square root of the thickness of the plate; and, therefore, the rings are smaller with a thick plate than with a thin one. Thus while a plate of a given thickness will produce a system of rings, the whole of which can be seen at once, a plate considerably thinner will give rings of so much larger diameter and greater breadth, that the whole system cannot be taken in at once by the eye. It is obvious, therefore, that the comparative doubly refracting power of two uniaxial crystals may be ascertained by observing the size of the rings produced by plates of equal thickness: with a powerful doubly refracting crystal the rings are less than with a crystal possessing this property in a weaker degree. In fact, the radii of the rings are inversely as the doubly refracting power of the crystal.

Let us now endeavour to explain generally the origin of the coloured rings and of the cross, according to the undulatory hypothesis; and, for precision and brevity of description, I shall suppose that tourmaline plates are used in the polariscope both for polarizing and analyzing,

The first tourmaline plate polarizes the light which is then incident on the Iceland spar. In their progress through the latter, some of the polarized rays suffer double refraction, others are transmitted without undergoing this change. For there are two rectangular planes of polarization of the luminous rays in

Iceland spar, one of the plane of polarization of the ordinary rays, the other of the extraordinary rays; and in those parts of the crystal in which the plane of polarization of the incident light coincides with either of the planes of polarization of the rays in the crystal, no double refraction occurs. On the other hand, in those parts of the crystal in which neither of its planes of polarization coincide with the plane of the incident polarized light, double refraction ensues.

Fig. 35.



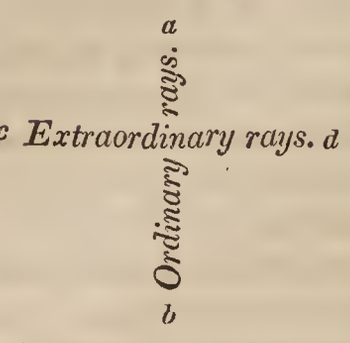
All the ordinary rays which emerge from the crystal, are polarized in planes which pass through the principal axis of the crystal: while the extraordinary rays will be polarized in planes perpendicular to these. Let fig. 35 represent the crystalline plate cut perpendicularly to the axis *e*. The radiating white lines represent the planes of polarization for the ordinary rays, and the circular white lines the planes of polarization for the extraordinary rays.

The two sets of rays (that is, the ordinary and the extraordinary) form two cones of refracted rays, having a common axis coincident with the axis of the crystal. The summit, or apex of each cone, will be at the eye of the observer; and the diameter of the base of the cone will of course vary according to its distance from the eye. The different rays, of which each cone is made up, undergo different changes. Those which form the axis of the cone, traverse the plate at a perpendicular incidence, and, therefore, are not refracted; while those which pass through the plate obliquely, undergo double refraction.

The ordinary or the extraordinary rays forming the same cone have not all an equal intensity at different parts of its circumference. For if the plane of polarization of the incident light be identical with or parallel to *a b*, fig. 35, it is evident, that while the intensity of the ordinary rays will be at a *maximum* in the plane *a b*, and at a *minimum* or *nil* in a direction perpendicular to this *c d*, the intensity of the extraordinary rays will be at a *maximum* in the plane *c d*, and at a *minimum* or *nil* in a direction perpendicular to this, *a b*.

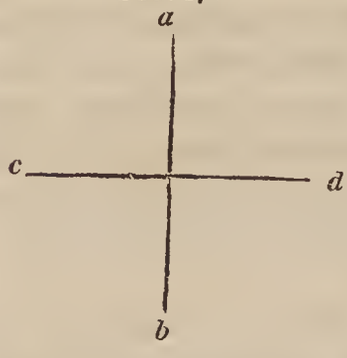
Hence those rays which are incident on the crystal in the plane *a b*, traverse the plate without having their plane of polarization charged, emerge as *ordinary* rays, and, by the subsequent action of the analyzing plate, form two arms of the rectangular cross, *a b* (fig. 36). Those rays which are incident on the crystal at any point of the line *c d* also traverse the crystal without having their plane of

Fig. 36.



polarization changed, but they emerge as *extraordinary* rays, and, by the subsequent action of the analyzer, form the remaining two arms of the rectangular cross *c d* (fig. 36). The two sets of polarized incident rays which thus traverse the crystal, without having their plane of polarization changed, and emerge, the one as the ordinary, the other as the extraordinary rays, form either a black or a white cross, according as they are either suppressed or transmitted by the second or analyzing tourmaline. If the two tourmalines be crossed the rays are suppressed—if they coincide the rays are transmitted. In the first case we perceive a black cross, in the second a white one.

Fig. 37.



Thus, then, all the rays which emerge from the second surface of the crystal, at any point of the two lines *a b*, *c d* (fig. 37), will not be divided into two, nor have their planes of polarization altered. But all the polarized rays which are incident on the crystal in any direction intermediate between the positions *a b* and *c d* suffer double refraction, since their planes of polarization coincides neither with the plane of polarization of the ordinary, nor with that of the extraordinary rays; that is, the vibrations of the incident rays are resolved into two sets, one which forms the ordinary rays, and the other perpendicular to it, which forms the extraordinary rays. The two systems of waves, produced by these two sets of vibrations, proceed through the crystal with unequal velocities and describe different paths; consequently they emerge in different phases, that is, in a condition for suffering interference by the action of the analyzer. In my last lecture, however, I so fully explained the agency of the analyzer in giving rise to the phenomena of colour, that I need not now enter further into it. I shall, therefore, only add, that the coloured rings owe their origin to interference.

A circumstance which affects the formation of the rings, is the inclination of the polarized rays to the optic axis of the crystal. In the axis itself, where the arms of the cross pass athwart each other, no colour is produced, consequently there can be, in this position, no double refraction. But those rays which suffer double refraction and produce colour, traverse the crystal obliquely, and at an inclination to the optic axis, and the obliquity or inclination augments in proportion as we recede from the centre or axis. Now the effect of an increase in the inclination of the rays to the optic axis is equivalent to an increase of thickness in the crystal. Hence it is obvious why we have rings,

and not an uniform tint, as in the case of the thin films of selenite described in our last lecture. Moreover, it is obvious that at equal distances around the axis the inclinations will be the same, and consequently the similar tints will be found at equal distances from the axis; in other words, the lines of equal tint or isochromatic lines will be disposed in concentric circles.

That the tints of the system of rings accompanying the black cross should be complementary to those which accompany the white cross, will be readily understood from what was stated in the last lecture respecting the office of the analyzing plate.

The rings of the two systems do not occupy the same position, but are transposed; that is, the bright rings of the one system occupy the position of the dark rings of the other system. The cause of this is obvious—the rings of the two systems are produced by different rays. The two sets of rays which successively pass through the tourmaline analyzing plate in its two positions, would, if this plate were not interposed, pass simultaneously and produce an uniform tint of the same colour as that of the incident light. In other words, without the analyzer neither cross nor rings would be perceived.

But why, it may be asked, is the maximum brilliancy of the rings at the middle of the four quadrants; that is, in lines or directions which are equidistant from the two nearest arms of the cross? Because it may be replied, it is at these spots that the ordinary and extraordinary rays (produced by double refraction) are equal. On either side of these directions, the ordinary ray has either a greater or less intensity than the extraordinary one.

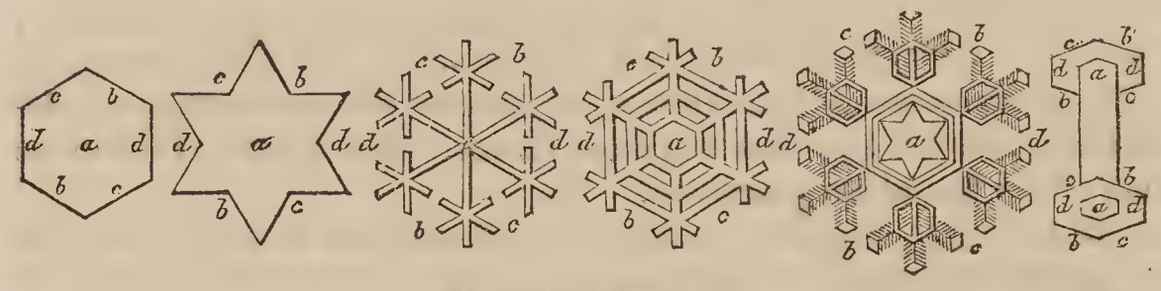
Iceland spar has, as I have already stated, a negative or repulsive axis; and I shall take this opportunity of explaining the method used by Dr. Brewster for distinguishing whether the axis of a crystal be positive or negative. Take a film of selenite (sulphate of lime), and mark on it the *neutral axes;* then, by a little wax, attach it to a plate of Iceland spar (cut so as to show the rings), and place them in the polariscope. If the film by itself produces the red of the second order, it will now, when combined with the Iceland spar, obliterate part of the red ring of the second order in two alternate and opposite quadrants (either *a c* and *b d*, or *a d* and *b c*, figs. 32 and 34). The line of the film which crosses these two quadrants at right angles to the rings is the *principal axis* of selenite, and should be marked as such. Then if we wish to examine whether any other system of rings is positive or negative, we have only to cross the rings with the principal axis " by interposing the film: and if it obliterates the red ring of the second order in the quadrant which it crosses, the system will be negative; but if it obliterates the same ring in the other two quadrants which it does not cross, then the system will be positive. It is of no consequence what colour the film polarizes, as it will always

obliterate the tint of the same nature in the system of rings under examination."

Plates of *tourmaline*, obtained by cutting the crystals at right angles to the principal or prismatic axis, as described in my first lecture, present circular rings and a cross when examined by the polariscope.

Ice belongs to the rhombohedric system. The beautiful and regular, though varied, crystalline forms of snow may be regarded as skeleton crystals of this system. I have here depicted (see fig. 38) a few forms taken from Captain Scoresby's work on the Arctic Regions; and in them you may readily trace the three secondary axes (*b b*, *c c*, *d d*), placed in the same plane, and inclined to each other at an angle of 60°, while the fourth or principal axis (*a a*) is perpendicular to the other three.

FIG. 38.



Crystals of Snow.

Now, if you take a sheet of clear ice, about an inch thick, and which has been slowly formed in still weather, and examine it by the polariscope, you will readily detect the circular rings and cross. The system of rings formed by ice is positive or attractive; and, therefore, is of an opposite kind to that of Iceland spar.

Exceptions.—To the general properties of crystals of the rhombohedric system some exceptions exist.

1. In Iceland spar, beryl, and other crystals of this system, the rings are not unfrequently distorted, owing to irregularities of crystalline structure.

2. *Quartz* belongs to this system, but its optical phenomena are very different to those of any other crystal, and will be described in my next Lecture, under the head of *circular polarization.*

3. *Amethyst* is another exception, which I shall hereafter describe.

4. *Chabasite* (a mineral compound of silica, alumina, lime water, and potash) is a rhombohedral crystal, sometimes endowed with remarkable optical properties. "In certain specimens of this mineral," says Dr. Brewster, "the molecules compose a regular central crystal, developing the phenomena of regular double refraction; but in consequence of some change in the state of the solution, the molecules not only begin to form a hemitrope crystal on all the sides of the central nucleus, but each successive stratum has an inferior doubly refracting force

till it wholly disappears. Beyond this limit it appears with an opposite character, and gradually increases till the crystal is complete. In this case the relative intensities of the axes or poles from which the forces of aggregation emanate, have been gradually changed, probably by the introduction of some minute matter, which chemical analysis may be unable to detect. If we suppose these axes to be three, and the foreign particles to be introduced, so as to weaken the force of aggregation of the greater axis, then the doubly refracting force will gradually diminish with the intensity of this axis, till it disappears, when the three axes are reduced to equality. By continuing to diminish the force of the third axis, the doubly refracting force will reappear with an opposite character, exactly as it does in the chabasite under consideration."

[*To be continued in our next.*]

THE SALE OF SPIRITS OF WINE.

The Manchester Guardian of August 26, contains a report of an information at the Borough Court, against Mr. Holyoake, one of our members. The first witness stated, that on the 28th of June, "a gentleman" (whom he identified as Mr. Watson, an exciseman) requested him to go to Mr. Holyoake's shop for half-a-pint of spirit of wine. The next witness was Mr. Watson, the exciseman, who swore that he had employed the former witness to fetch the spirit, which he produced. In the minor details there was some discrepancy in the evidence of these witnesses. Mr. Bent, who appeared for the defence, contended that the charge being brought under the 6th Geo. IV., cap. 81, sect. 2 and 26, his client was not liable to a penalty, because this Act allows Chemists and Apothecaries to sell spirits of wine for medicinal purposes; and also contains a clause which expressly continues all the provisions of the Acts passed before 1825, and consequently that of the 12th sect. of the 16th Geo. II., cap. 8, which preserves the right to Chemists, &c. to sell any quantity not exceeding a pint, Mr. Kelly stated, in reply, that this Act was altogether repealed; on which Mr. Bent shifted his ground, stating that he had another line of defence, which, on the present occasion, would render it unnecessary to discuss that point of law; he, therefore, produced witnesses who proved, that on the day in question, Mr. Holyoake happened to have no spirit of wine on the premises, as he was obliged to borrow three ounces from a neighbour, for a prescription which came in at the time. The sale of the spirit not being proved, the Magistrates decided in favour of the defendant; but the Excise have subsequently served Mr. Holyoake with a notice that they shall carry the case to the sessions. A Correspondent informs

us, that "the exciseman is the same who has laid other informations in the neighbourhood, and in this case, as well as a former one, clandestine offers were made before the trial to compromise the matter."

It appears from the circumstances connected with the above case, that the present state of the law on this subject, is calculated to give rise to much annoyance, since the lawyers themselves differ in opinion respecting the interpretation of the clauses on which we rely for protection. We have already furnished our readers with the most important extracts* from the Acts of Parliament which we received from our solicitor; but it appears, on further investigation, that other Acts on various subjects have been passed, containing *riders* or supplementary clauses, respecting the sale of spirit of wine; which clauses involve the question in considerable mystery. In order to give our readers an idea of the intricacy which exists, we subjoin a list† of all the Acts which we have been able to collect in which the sale of spirit is mentioned. Some of these Acts (of which we only give the titles) repeal wholly or in part, others amend, previous enactments; others re-enact certain clauses or parts of clauses which had been repealed; and thus the absolute meaning of the statutes is so obscure as to give ample scope for vexatious litigation. In addition to the annoyance, arising from this imperfect state of the law, we are also liable to suffer from the persecutions of excisemen, or persons acting as such, who have the power of making a profit by any act of delinquency on the part of a Chemist in the unconscious violation of a law which he does not understand, and who may even obtain the conviction of parties who are innocent, by artfully managing the case, and delaying the information for several months, to increase the difficulty of making a defence.

The Council of the Society having, at their last meeting, again discussed the subject, determined to obtain further advice as to the course which ought to be adopted for the protection of the trade, and accordingly instructed our solicitor to draw up a statement of the case for the opinion of counsel. A Committee was also appointed to act as might appear advisable, and report to the next Council. It will be recollected that a memorial was presented to the Treasury several months ago, and the Council have delayed taking the above course until the present time, in expectation of receiving some indemnification from that quarter; but no answer having been received, it was considered necessary to resort to the highest legal authority for advice as to the most likely means of obtaining redress. We will report progress in our next number.

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* See vol. ii., p. 672. † See page 188 of this number.

ORIGINAL COMMUNICATIONS.

ON THE MALAMBO, OR MATIAS BARK.

BY ALEXANDER URE, ESQ.

Surgeon to the Western Ophthalmic Institution, &c.

A QUANTITY of the bark of a tree, said to have come from Colombia, in South America, was sometime since placed in my hands by Hugh Houston, Esq., that gentleman having received it from Dr. Mackay, who communicated two papers respecting it, under the name of Matias Bark, to the British Association*. He there mentions his having procured from it, by distillation, two oils, one lighter than water, of specific gravity 0.949; the other denser, of specific gravity 1.028. He further obtained a brown extractive substance of an intensely bitter taste. Dr. Mackay remarked, that it had been successfully administered in intermittent fever, in convalescence from continued fever, in hemicrania, dyspepsia, and in a variety of chronic ailments, where tonics and stimulants were indicated; and that as an adjunct to diuretic remedies, it had been found eminently useful.

The so-called Matias bark is from three to four lines thick; brittle, though somewhat fibrous; emitting, when fresh bruised, an aromatic hue, not unlike that of acorus calamus. It is of a brown hue, covered with an ash-coloured tuberculous epiderm. It possesses a bitter pungent taste. With water it forms an agreeable bitter infusion; with alcohol a powerful bitter tincture. Ether extracts from it volatile oil and resin. Heated along with hydrate of potash, free ammonia is disengaged, indicating the presence of an azotized principle. It is without astringency.

It appears to coincide, as suggested to me by M. Guibourt, both in regard to physical and sensible qualities, with Malambo, the Indian name for the bark of a tree which grows in New Granada, and which is held in high esteem among the natives as a febrifuge and stomachic.

Malambo bark was analyzed by M. Cadet Gassicourt, about twenty-eight years ago (*Journ. de Pharmacie*, tom. ii., p. 172); subsequently, by M. Vauquelin, who ascertained the presence of three distinct substances: namely, 1. An aromatic volatile oil. 2. A very bitter resin. 3. An extract, soluble in water, which yielded ammonia, when heated with caustic potash (*Annales de Chimie*, tom. xcvi. p. 113). It afforded no

* *Report of British Association*, vol. ix., p. 62; and vol. x., p. 162.

tannin, scarcely a trace of gallic acid, and none of the alkalis of cinchona. It is stated, that in the countries where the tree is indigenous, incisions are made in the bark, and there exudes an aromatic oil which sinks in water. Most authors believe it to be the produce of a species of *drimys;* but M. Bonpland regards it as a *quassia* (*Merat et de Lens, Dictionnaire de Mat. Med.*, tome iv., p. 199). This, however, is improbable, since none of the quassia tribe yet discovered are possessed of aroma.

The above Colombian bark has been frequently administered by me as a substitute for cinchona with good effect. It offers the useful combination of a tonic and aromatic; and seems to exercise its beneficial influence on the principle laid down by Professor Schultz, with regard to other therapeutic agents of the same class, namely, in promoting an increased flow of bile, whereby digestion is perfected, and healthy blood formed*. In scrofulous ophthalmia, after removing feculent accumulations from the bowels, I have known an infusion, made with two drachms of the bark to a pint of water, cause a speedy and complete removal of the inflammation and morbid sensibility of the eyes. The dose of the infusion just mentioned is from one to two ounces, repeated twice or thrice in the course of the day. It may, in some instances, be advantageously conjoined with salts of iron, or of mercury, with both of which it is compatible. The addition of a little syrup of orange-peel, and compound tincture of cardamom forms a draught by no means disagreeable.

ON THE NATURE AND PROPERTIES OF A LIQUID SOLD UNDER THE NAME OF *TER-CHLORIDE OF CARBON.*

BY ALEXANDER URE, ESQ.

In the Lancet of July 15, 1843, is a paper by E. W. Tuson, Esq., F.R.S., Surgeon to the Middlesex Hospital, "On the Effect of the Ter-Chloride of Carbon." That gentleman states its having proved beneficial in relieving the pain, and destroying the fetor of the discharge, of cancerous sores, besides producing other peculiar effects of an advantageous nature. He further extols its employment in cases of senile gangrene, sloughing ulcer, uterine and neuralgic affections, and in some instances of severe sickness after the usual remedies had failed. "It allays nervous irritability, removes anxiety of mind, invigorates and raises the spirits, and where patients have one day been in a

* *De Alimentorum Concoctione.* Berolini, 1834, p. 21.

state of complete misery, they have on the following one become happy and joyful from its effects."

"The ter-chloride of carbon," continues Mr. Tuson, "is a clear transparent fluid, smelling strongly of chlorine, as its name implies; it consists of three parts of chlorine and one of carbon; the dose from one to four drops in water, two or three times a day; one to two drachms to a pint of water as an injection or lotion."

Not being acquainted with any *ter-chloride* having the composition above assigned, or of any mere compound of chlorine and carbon, which is soluble in water, I was induced for information to refer to the work of Berzelius. In vol. i., p. 131, of the Brussels edition, we find described:—

1. A combination of one atom of carbon with three atoms of chlorine. This is a solid substance devoid of colour or taste. Its specific gravity is nearly twice that of water. It enters into fusion at 320°, and boils at 356° Fahr. It does *not* dissolve in water, either cold or hot, but is soluble in alcohol, and still more so in ether. These solutions are not affected by nitrate of silver.

2. A compound of one volume of carbon and two volumes of chlorine. Its specific gravity is 1.5526. Although liquid it is *insoluble* in water.

3. A combination of equal volumes of chlorine and carbon. It occurs as a sublimate. It too is *insoluble* in water.

In order to ascertain the properties of the liquid referred to in Mr. Tuson's paper, I sent for a small quantity of the so-called ter-chloride. It possessed an ethereous character, mixed freely with water; having a specific gravity of 0.882, boiling at a temperature of 170° Fahr., exhibiting an acid reaction with moist litmus paper, and affording a white precipitate on the addition of nitrate of silver. It is, therefore, totally different from any of the compounds heretofore described, as chlorides of carbon, but bears a strong resemblance to what is sometimes termed chloric ether, a preparation which has, I believe, been for years usefully employed as an agreeable internal stimulant.

With the view of testing the topical efficacy of the preparation in question, I tried it in three cases; but regret to state, that the results obtained were by no means encouraging. Upon the 2d of August last, I prescribed for a patient labouring under ulcerated cancer of the tongue, a lotion composed of one drachm to a pint of water. Here it produced no benefit beyond that of a simple detergent. The patient died after suffering excruciating agony at the end of the month.

Upon the 12th of August I ordered a similar lotion, in the hope of procuring some sedative effect in the instance of a

gentleman under my care, who for several years past has been afflicted with extensive and obstinate erosive ulceration of the skin surrounding the throat, and which is accompanied with most distressing itching and irritation. Under its use, however, the whole throat became perfectly raw, the discharge copious, and his sufferings from soreness and itching were extreme, so that after persevering steadily for three days, he was obliged to give it up.

About the same period, I was consulted by my friend Mr. French, of Great Marlborough Street, respecting a patient of his who had a cancerous sore upon the right leg. Here I advised a trial of the above lotion; but after applying it assiduously during three consecutive weeks, no improvement could be perceived.

DANIELL'S CONSTANT GALVANIC BATTERY.

Daniell's battery, as usually constructed, consists of a copper cylinder three-and-a-half inches in diameter, and varying in length according to the power required. One end of this cylinder is closed, forming the bottom of the cell, and at the other end, about two inches from the top, there is a ledge on which rests a perforated shelf or colander, having a round hole in the centre, two inches in diameter, through which a membraneous tube made of the gullet of an ox, and reaching nearly to the bottom of the copper cylinder, is suspended by a rim, which rests on the perforated shelf. A cylindrical rod of zinc, half an inch in diameter, is placed in the centre of the membraneous tube, reaching nearly to the bottom of it, and resting, by means of a cross bar of wood, on the top of the copper cylinder.

To charge this battery, the surface of the zinc rod is amalgamated by rubbing it over with mercury and diluted sulphuric acid. The membraneous tube is then filled with dilute sulphuric acid (one measure of oil of vitriol to seven measures of water), and the space between the membraneous tube and the copper cylinder is filled with the same dilute acid in which sulphate of copper has been dissolved to saturation. On immersing the amalgamated zinc rod into the acid solution contained in the membraneous tube, chemical action commences; a portion of the zinc is dissolved by the acid, and hydrogen gas is liberated; but this gas, instead of rising and escaping, by virtue of its elasticity, adheres to the surface of the amalgam in small bubbles, which thus shield the metal from the further action of the acid. This effect takes place when perfectly pure zinc is immersed in dilute sulphuric acid; but

it is more completely ensured by amalgamating the surface of the zinc. This is the purpose for which the zinc rods are thus prepared.

Now, on connecting the zinc rod and copper cylinder, the hydrogen gas, resulting from the decomposition of the acidulated water during the solution of the zinc, is no longer evolved, as before, on the surface of the zinc; it appears, if at all, as in other forms of the battery, on the surface of the copper, having apparently travelled through the intervening liquid. There is now, therefore, no obstacle to the action of the acid on the zinc; and the solution of this is rapidly effected, the power of the battery depending, indeed, on the quantity of zinc dissolved.

The material distinction, however, between Daniell's battery and others, such as Babington's or Wollaston's, consists in the use of two different liquids—one in contact with the zinc, and the other with the copper; and the separation of these, by means of a porous diaphragm. It is in consequence of this arrangement that Daniell's battery acquires the name by which it is often distinguished, *the constant battery*. It is well known to those accustomed to the use of apparatus of this kind, that Babington's or Wollaston's batteries are very inconstant and uncertain in their effects. Although quite efficient when first charged, they gradually lose their power, until at last the current entirely ceases. This is not the case with Daniell's battery, which retains its power unaltered for many hours, and hence its designation, *the constant battery*.

The *going down of the power* in the ordinary battery, is occasioned by the deposition of zinc on the surface of the copper or conducting metal. When both metals are immersed in an undivided cell, containing, for instance, dilute sulphuric acid, the deposition of the zinc on the surface of the copper is effected in the following manner: On closing the circuit, the zinc is dissolved by the acid, and sulphate of zinc diffused through the liquid, while hydrogen gas is evolved on the surface of the copper, and this in its nascent state, again reduces a portion of the zinc, the oxygen of its oxide combining with the hydrogen to form water, while the metal is precipitated over the copper. No sooner is the copper covered with a coating of zinc, thus thrown down upon it, than the power of the battery entirely ceases. The usual method of restoring the power of a battery under such circumstances, is, to break the circuit, when the hydrogen being no longer evolved at the copper plate, the zinc is soon dissolved off by the acid, and the battery is again in an active condition.

In Daniell's battery no zinc can be deposited on the copper, because the solution of the zinc is retained within the porous tube, while the membrane offers no obstruction to the transmission

of the hydrogen to the copper surface; where, acting on the solution of sulphate of copper, it causes a constant deposition of pure metallic copper; thus renewing the surface and securing the uniform activity of the battery. As a portion of the copper is thus continually removed during the action of the battery, from the solution in the outer cell, it is desirable to have a fresh quantity of the salt added, to preserve the saturation of the solution; and it is for this purpose that the perforated shelf or colander, already described, is provided, that some crystals of sulphate of copper may be placed here, in the upper stratum of the liquid.

This battery has been found to possess decided advantages, where a continued and uniform action is required. The frequent use of it, however, becomes expensive, and, during its disuse, the membraneous tubes are apt to be destroyed, either from decomposition, or from the attacks of mice, &c.

Instead of the animal membrane, porous earthenware tubes are sometimes used, but there are two objections to this material, in the first place, it has been found, as stated by Mr. Daniell in the last edition of his *Introduction to Chemical Philosophy*, that the porous earthenware offers an obstruction to the electric current; and, secondly, that these tubes, which are rather expensive, become very brittle from the action of the acid solution, and are therefore obliged to be frequently replaced. Canvass has recently been tried, as an economical material to form the tubes of, and in many respects it appears to answer the purpose remarkably well. It is not subject to the objections which apply either to earthenware, or to animal membrane. Some practical difficulties have been found however, in the application even of this material. In the first experiments that were tried, the tubes were made of a coarse canvass, sewed so that a seam extended along their whole length, but it was found very difficult to preserve the cylindrical form of these tubes when put into the liquid. They were apt to collapse on to the zinc rods, and on this taking place, the action of the battery entirely ceased. It is evident, that when the tube thus collapses, the sulphate of copper in the outer cell will come into contact with the zinc, and metallic copper will be immediately precipitated on to the surface of the canvass. The consequence of this is, that extensive local action takes place on the zinc, much of which is dissolved, while the copper deposited on the canvass, takes the place of the outer cylinder, and prevents the current from passing through its intended channel. In order to obviate this evil, Mr. Newman, of Regent Street, has had tubes made of a very thick canvass, somewhat resembling strong bed-sacking, woven in one piece. These tubes, having no seam, and being very thick, have no tendency to collapse.

THE HYDRO-ELECTRIC MACHINE,

Which has recently been added to the popular attractions at the Polytechnic Institution in Regent Street, was put into operation on Friday evening, the 15th of September, in the presence of a numerous company of scientific men and the friends of the Directors, previous to the re-opening of the Institution.

The machine consists of a cylindrical steam-boiler, made of rolled iron plate, supported on six green glass pillars or legs, and furnished with forty-six jets, through which the steam escapes. This boiler, including the fire-place and smoke-chamber, is three feet six inches in diameter, and seven feet six inches in length. The fire-place is contained within the boiler, and the heated air is carried through tubes terminating in a smoke chamber, which is surmounted by a moveable funnel or chimney. The steam jets are attached to iron pipes, several feet in length; and a sufficient quantity of the steam is condensed in passing through these pipes, to admit of the necessary friction of the condensed water during its passage through the wooden jets.

The steam is discharged into an aperture communicating with the chimney, so that very little annoyance is experienced from its escape into the apartment; and in this aperture is placed a row of metallic points communicating with the ground, by which the electricity of the discharged steam is carried off.

Some very extraordinary effects were produced with this machine. Sparks of a most vivid character were obtained through a space of twenty-two inches, and a large battery, consisting of twenty-four Leyden jars, and having between eighty and ninety square feet of coated surface, was charged and discharged six times in forty-five seconds. The chemical decomposition of water and of salts, and the deflection of the magnetic needle were effected. A very beautiful experiment was also performed in illustration of the *aurora borealis*, in which the cork-screw appearance of the stream of light was perfectly apparent.

The steam was under a pressure of about fifty pounds to the inch during the performance of these experiments.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Hill Street, Richmond, Sept. 9, 1843.

Sir,—In answer to your Correspondent "Alfred," I request the favour of the insertion, in the next number of your valuable Journal, of the following formulæ for

MOXON'S MAGNESIAN APERIENT.

℞ Magnes. Sulph.
Sodæ Carbon. āā lbj ;
Acid. Tart. lbss. M.

The ingredients to be separately and well dried.

POWELL'S PECTORAL BALSAM.

℞ Rad. Ipecac. Contusæ, ℥iss.
Flor. Benzoin.
Opii Crudi, āā ℥ss.
Ol. Anisi, ℥iij.
Spirit. Vin. Rectif. Oij.
Aquæ Distill. Oj.

Macerate for fourteen days, and add,
Ext. Glycyrrhizæ, ℥vj.
Potass. Carbon. ℥iv,
dissolved in a pint of water, and add
Tinct. Digitalis, ℥vij.

FREEMAN'S BATHING SPIRITS.

℞ Lin. Saponis, ℥iv.
Spirit. Vin. Rectif. ℥j.
Tinct. Lavand. Co. gtt. xxv.
Ol. Rorismar. ℥ss. M.

I remain, Sir, yours, very respectfully,
ROBERT WHITE.

[We insert the above on Mr. White's authority, in the belief that the formulæ are correct, although we have no means of verifying them.—ED.]

INSTANCE OF THE SAGACITY OF BEES.

A FEW pounds of honey had been taken from a hive (about six miles from London), and placed in a closet, under lock and key. The windows of the room having been left open, the bees obtained admission, and entering the closet under the door, removed the whole of the honey. The cells of wax were left entire, and the honey was conveyed to the central division of the hive, where it was safely deposited in the course of the day. It is evident that spies must have been employed to observe where the honey was placed, and that as soon as the information was communicated to the hive, the swarm took this vigorous measure for the recovery of the stolen property. It is remarkable, that they should have succeeded so completely and in so short a time, since the closet was entirely dark, and they could only enter by a crevice under the door.

EXTRACTED ARTICLES.

ON THE BEBEERU TREE OF BRITISH GUIANA.

(Condensed from a Paper, by D. Maclagan, M.D., F.R.S.E., published in the Transactions of the Royal Society of Edinburgh.)

"The bark occurs in large flat pieces, from one to two feet long, and varying in breadth from two to six inches. It is about four lines thick; heavy, and with a rough fibrous fracture; dark cinnamon-brown, and rather smooth within; and covered externally by a splintering greyish-brown epidermis. It has little or no pungency or acrimony, but a strong persistent, bitter taste, with considerable astringency.

"The fruit is a nut, of an obovate form, slightly compressed. The pericarp is greyish-brown; hard and brittle, half a line thick, rather rough externally, except at the part surrounding the point of its attachment to the footstalk, where it is smooth, and has probably been imbedded in the calyx. The cotyledons are plano-convex; and when in opposition, are of the size and general figure of a walnut.

"The precise nature of the tree is unknown; but it is supposed to be a lauraceous plant of large size, the timber of which is known to wood-merchants by the name of *greenheart*.

"Mr. Rodie, the original discoverer, subjected the bark to chemical experiment, and prepared a solution of the sulphate of its alkali. Samples were also sent to manufacturing Chemists in London, who operated upon the bark as well as the seeds. By a process similar to that of the Pharmacopœia for obtaining quinine, an alkaline pulverulent uncrystallizable substance was thrown down, most of which is soluble in anhydrous ether, and the remainder in alcohol. The ethereal solution being treated with animal charcoal, filtered and evaporated, yields shining reddish-brown scales, not crystalline. This substance, which is called *Bebeerine*, is found to have antiperiodic properties, having been administered with marked success in agues and intermittent fevers. The alcoholic solution above mentioned yields an alkaline matter, which has been called *Sipeerine*, but which has not been minutely examined.

"The tannin of *bebeeru bark* resembles, in its general characters, that variety which exists in the cinchona barks."

This tree is not at present in the market as an article of the Materia Medica; but the author of the paper states that he has received a barrel of the bark, and likewise of the fruit of the plant. If repeated experiments should confirm the opinion already expressed respecting its utility, a further supply might be obtained from British Guiana, where the tree is indigenous.

SIMPLE METHOD OF ASCERTAINING THE PRESENCE OF MINUTE QUANTITIES OF NITROGEN IN ORGANIC SUBSTANCES.

BY M. LASSAIGNE.

The presence of nitrogen in organic substances is generally indicated by different reactions, which isolate this body, in the gaseous state, by burning the combustible elements with which it was combined, or which transform it into ammonia, the properties of which are easily distinguished.

These methods, which are in daily use among Chemists, answer very well for determining the proportion of nitrogen in a weighed quantity of organic matter, but are almost inapplicable when the quantity of matter to be examined is very minute.

The process which I have adopted, after submitting it to numerous trials, is so sensible as to afford indications of the presence of nitrogen in substances containing that body, the quantities of which could scarcely be estimated by the most delicate balance. The principle upon which this process is founded, although recognised by Chemists, has not heretofore, that I am aware, been applied to this purpose. The method alluded to depends upon the facility with which cyanide of potassium is formed when an excess of potassium is calcined to dull redness, in a tube, with an organic substance containing even a small proportion of nitrogen. The product of this calcination being mixed with a few drops of cold distilled water, affords an alkaline liquor, which, mixed with a soluble ferroso-ferric salt, occasions a greenish or yellowish blue precipitate, which, in contact with a few drops of hydrochloric acid, is rendered perfectly blue.

Quantities inappreciable by Fontin's balance, of *urea*, *uric acid*, *allantoine*, *albumen*, *fibrin*, *dried gluten*, *morphia*, *narcotine* or *cinchonia*, calcined in a small glass tube, after placing them on small fragments of potassium, have always afforded distinct and well-defined reactions, in proportion to the quantities of nitrogen contained in these organic substances. Comparative experiments made on non-azotized substances, such as *pure sugar*, *starch*, *gum*, *and salicine*, afforded no similar reaction. Lastly, in operating on complex substances, containing azotized and non-azotized principles combined, the presence of the nitrogen has been distinctly indicated in extremely small quantities of the substance. Thus, in a few minutes, the nitrogen may be detected in a small portion of wheat, of barley, or of dried crust of bread.

The minute quantities of matter on which we operate by this process renders it necessary to use a very small glass tube, about one inch in length and the twentieth of an inch in diameter. A small fragment of potassium, about the size of a millet-seed is to be introduced into this tube, previously sealed at one end. The potassium being moulded into a cup shape with a piece of platinum wire, the substance to be calcined is to be introduced into the hollow part. In some cases, where the matter operated upon is volatile, it should be placed under the potassium, so that it may be brought in contact with the metal during the action of the heat. These arrangements being made, hold the tube near to its open end by means of a forceps, and heat it gradually in the flame of a spirit lamp, until the excess of potassium is driven off in vapour through the carbonized organic matter. This point is easily known by observing the greenish vapour formed by the potassium at a little distance from the heated part of the tube. After having raised the heat to dull redness, the tube is to be withdrawn from the flame and allowed to cool. To obtain the product of the calcination, the little tube is to be cut in two by means of a small file, and then put into a porcelain capsule, and four or five drops of distilled water added to dissolve the cyanide which may have been formed. The resulting liquor, decanted from the carbonaceous residue, is to

be tested with a drop of ferroso-ferric sulphate (sulphate of magnetic oxide of iron), when a dirty green precipitate will be immediately formed, turning to a fine blue on the addition of a drop of hydrochloric acid, if the substance operated upon contain azote, even in minute quantity. If no azote were present, the hydrated oxide of iron, occasioned by the addition of the salt of iron, will be entirely redissolved without causing any blue colour.

The formation of cyanide of potassium, resulting, as is known, from the calcination, under suitable circumstances, of azotized organic matters with potash, might lead to the expectation that if the potassium were replaced by hydrate or carbonate of potash, in the process above described, the result would be similar; experience, however, has proved the contrary, at least in those cases in which I have experimented. Thus, equal quantities of azotized organic matter, calcined to dull redness in small tubes with caustic potash and with carbonate of potash afforded no cyanide of potassium, while the calcination at the same temperature with potassium, always afforded a product the reaction of which clearly indicated the presence of cyanide.

The use of potassium, then, offers an evident advantage in the cases alluded to, for determining the presence of minute quantities of azote. The result, however, may be considered as doubtful, if a non-azotized substance might be accidentally mixed with a small quantity of some nitrate or ammoniacal salt. In these two cases, the potassium, acting on such salts, together with the carbon of a non-azotized body, may produce a little cyanide of potassium, which would afterwards afford the characteristic reaction with the salt of iron. The experiments I have made with starch mixed with a little nitrate of potash or ammoniacal salt, have shown that under these circumstances a very small quantity of cyanide of potassium is formed.

The examination of an organic body for azote, as a constituent principle, should generally be made on substances previously purified, and, consequently, deprived of nitrates and ammoniacal salts, the presence of which is so easily ascertained by means already known, and, with this precaution, the process here described is applicable in most cases. This simple method should especially be adopted when the object is simply to obtain clear evidence of the presence of azote.

Many applications of this process, so easy of execution in a few minutes, will no doubt suggest themselves. I have already employed it for determining the presence of azotized matter in the excrements of a mouse which had been fed on *pure starch* and *pure sugar*. This observation, which, at first sight, appears inconsistent with the chemico-physiological views recently promulgated, confirms those put forth in 1825, by M. Leuret and myself,—that *alimentary matter, in passing through the intestinal canal, becomes mixed with foreign substances; and that the excrementitious matter, formed after the process of digestion, need not consist exclusively of the product of that process, but is more or less mixed with principles furnished by the different secretions of the digestive canal.*

The same method of examination, applied to the study of several products resulting from the prolonged action of solution of ammonia on olive oil, has enabled me to detect the formation of an *azotized substance, neutral* and *crystallizable*, which for the present I have named, from the manner of its production, *elamine*. The first syllable of this word is taken from the Greek word ελαιον (oil), and the second from the three initials of the word *ammoniaque*. This action of ammonia on olive oil, which thus differs from that exercised by the other alkalies, appears to me to resemble, in some respects, the reaction which has been remarked by MM. Dumas and Boullay, on treating certain ethers with ammonia. This observation establishes a new comparison between certain fatty substances and some of the ethers.

From the facts and observations above stated, it follows:

1st. That potassium, heated to dull redness with an azotized organic sub-

stance, easily transforms it, in part, into cyanide, the presence of which may afterwards be detected by a salt of iron.

2d. That in this process, under the conditions in which it is employed, to afford a sensible indication of azote in a minute portion of organic matter, the potassium cannot be replaced either by the *hydrate* or the *carbonate of potash.*

3rd. That the application of this simple process to the detection of azote in a variety of products of organization, affords the means of solving numerous important questions in animal and vegetable physiology, where it is necessary to submit the products to very numerous experiments.—*Comptes Rendus.*

ON THE NEW MODE OF DETECTING ARSENIC.

BY DR. CHRISTISON.

A SHORT time since, Professor Reinsch proposed an entirely new method of detecting arsenic, which consists in acidulating any suspected fluid with hydrochloric acid, and heating a thin plate of bright copper in it, upon which the arsenic is deposited in a thin metallic crust, and then separating the arsenic from the copper, in the state of oxide, by subjecting the copper to a low red heat in a glass tube. Organic fluids and solids may be prepared for this process, by boiling them for half an hour with a little hydrochloric acid, solid matters being cut into small shreds, sufficient water being added to let the ebullition go on quietly. Continue the boiling until the solids are dissolved, or reduced to minute division. Nothing can be more easy than the method of Reinsch. It is also exceedingly delicate; for it will detect a 250,000th part of arsenic in a fluid, and it does not leave any arsenic in the subject of analysis which can be detected by any other means, even by the delicate process of Mr. Marsh. I have lately employed it as the means of furnishing irrefragable evidence in criminal inquiries.

The separation of arsenic upon copper, from a solution, by means of hydrochloric acid and heat, is a new fact in chemistry; and the experiment furnishes a test so far, that if the copper be not tarnished, arsenic cannot be present. But Reinsch's discovery cannot be regarded as a *positive* test, because, as he himself has pointed out, bismuth, tin, zinc, and, above all, antimony, will, under the same circumstances, yield a coating to copper sufficiently similar to render it necessary that the deposit be examined otherwise than by the eye only. Reinsch's process, however, is of far greater value than if it had merely presented a new test for arsenic. It constitutes the easiest and most secure mode of so separating arsenic from complex mixture, as to enable experimentalists to apply to the metal any of the tests for arsenic already known; and, in my opinion, no method of testing for it approaches the following in conclusiveness:—Cut the copper on which the arsenic is deposited, into small chips, so that they may be easily packed at the bottom of a small glass tube. Apply a low red heat. A white crystalline powder sublimes, in which, in the sunshine, or with a candle near it, a magnifier of five powers will show the equilateral triangles composing the facets of the octahedral crystals, which are formed by arsenious acid when it sublimes. Sometimes the three equal angles, composing a corner of the octahedron, may be seen by turning the glass in various directions. If triangular facets cannot be distinguished, owing to the minuteness of the crystals, then shake out the copper chips, close the tube with the finger, and heat the sublimed powder over a very minute spirit-lamp flame, chasing it up and down the tube until crystals of adequate size are formed. Next boil a little distilled water in the tube over the part where the crystalline powder is collected, and, when the solution is cold,

divide it into three parts, to be tested with ammoniacal nitrate of silver, ammoniacal sulphate of copper, and sulphuretted hydrogen, either in the state of gas or dissolved in water. I am surprised, that during the last four or five years, neither Orfila, nor M. Lassaigne, nor Liebig, nor Mr. L. Thomson, nor Mr. Watson, nor Mr. Marsh himself, nor any other experimentalist, excepting in Scotland, has thought of applying, as a test of an arsenical crust, the conclusive process described above, and first suggested to me, in 1826, by the late Dr. Turner, which consists in converting the metal into the oxide in such a way as to allow the form of its crystals to be determined. The method has been in constant use in medico-legal researches in Scotland. Yet, what other method is so satisfactory ? What substance, other than arsenic, yields the white sublimate with triangular facets, or leaves the substance in such subjection to so many excellent tests ?

In boiling substances in the weak hydrochloric acid, a decided excess of acid must always be present,—two fluid drachms to every eight ounces of liquid ; but if the matter be animal texture in decay, much more acid may be necessary, owing to the presence of ammonia, which gradually neutralizes the acid as the solution goes on. Filtration of the fluid after the acid has acted sufficiently, seems advisable, otherwise organic particles may attach themselves to the copper, and give rise to empyreuma, when the metallic arsenic is driven off by heat. When the arsenic in the fluid is supposed to be small, nearly half an hour should elapse before the copper or copper-leaf is removed. Before applying the sulphuretted hydrogen as a test to the solution of the sublimed oxide, the solution must be acidulated with hydrochloric or acetic acid. In every case the whole process should be applied in the first instance to distilled water, acidulated with the hydrochloric acid to be employed afterwards ; and if the copper be tarnished, a purer acid must be obtained, or the copper must be subjected to the subsequent steps of the process, in order to ascertain whether the tarnishing be occasioned by arsenic or not.

I have successfully employed the preceding method in two medico-legal cases, where the bodies had been buried for four months, and I consider that it must soon supersede the beautiful but much more elaborate method of Marsh.—See *London and Edin. Journ. of Med. Science*, Sept. 1843.

EXAMINATION OF THE MOTHER OF VINEGAR.

(Mycoderma, *Pers.* ; Hygrocrocis *Agardh.*)

BY MÜLDER.

This investigation was undertaken with a view of tracing the formation of organic substances from inorganic chemical combinations.

Mother of vinegar (*mater aceti*) is a mould-plant which is developed in vinegar, and forms therein a thick leather-like coat similar to the inflammatory crust which covers the crassamentum of blood drawn from rheumatic patients. It is produced not merely in but from the vinegar, and as it forms the acetic acid diminishes, until ultimately water alone remains.

The mould-plant belongs to the genus *mycoderma* of Persoon, or *hygrocrocis* of Agardh. It is one of the simplest vegetable formations, and belongs to the Fungi rather than to the Algæ. It is formed in vinegar obtained both from wine and beer, but not in that procured from wood. It exists in unmixed vinegar, and also in vinegar in which organic substances are preserved. These substances, however, contribute nothing towards the development of the plant, but merely promote the production of a germ or a cell from which the mould-plant is formed out of the elements of the acetic acid. In all cases, whether organic substances be or be not contained in the vinegar, the mycoderma has the same conformation and chemical composition.

The principal constituents of vinegar are acetic acid ($C_4 H_3 O_3$) and water. In addition to these it contains some salts, a little sugar, gum, extractive, and, above all, some proteine, derived from the albumen of the grape, and dissolved in the acetic acid. The presence of vegetable substances, as cucumbers, cherries, &c., may augment the quantity of proteine, but this increase is not necessary for the formation of the plant.

The nutritious elements of this mould-plant are $C_4 H_3 O_3$ (*acetic acid*), and $C_{40} H_{31} N_5 O_{12}$ (*proteine*).

We find these constituents grouped, in a simple form, in the plant, while the proteine and the acetic acid have disappeared from the liquid. The plant contains nothing more; and the transformation of the acetic acid and proteine into a plant can, therefore, be chemically traced.

It is remarkable that the plant always has the same chemical composition, consequently its organization requires a certain proportion of acetic acid and proteine: the latter remains unchanged, but the former takes up water, and becomes cellular tissue. The new product of acetic acid combines in certain atomic proportions with the proteine. This organization demands, therefore, certain chemical proportions just as much as in the formation of sulphate of lime from lime and sulphuric acid.

Mulder analyzed three plants formed in vinegars containing different vegetable substances. His results gave as the formula for the plant, $C_{136} H_{115} N_5 O_{96}$. The quantity of nitrogen contained in proteine, is taken as the basis of the formula. By potash all the proteine may be removed, and the residue is pure cellular tissue. The latter, according to Payen's analysis, and corroborated by experiment, has for its formula, $C_{24} H_{21} O_{21}$.

Mycoderma aceti or mother of vinegar consists, therefore, of proteine and cellular tissue.

Mycoderma aceti	C_{136}	H_{115}	N_5	O_{96}
1 eq. Proteine	C_{40}	H_{31}	N_5	O_{12}
4 eq. Cellulose	C_{96}	H_{84}		O_{84}
	C_{136}	H_{115}	N_5	O_{96}.

It has been observed that the proteine is present in vinegar, as albumen of grape. The question now is, in which way $C_{96} H_{84} O_{84}$, or four equivalents of cellular tissue, could combine with one equivalent of proteine, and whence the chief constituent of the plant is derived? The facts that pure vinegar yields the mother of vinegar, and that acetic acid invariably disappears, prove that this cellular tissue is generated from the acetic acid, that is, from $C_4 H_3 O^3$. This can take place in no other manner than according to the following plan:—

24 eq. Acetic acid	C_{96}	H_{72}	O_{72}
12 eq. Water		H_{12}	O_{12}
	C_{96}	H_{84}	O_{84}

equal to four equivalents of cellulose. — *Annalen der Chemie und Pharmacie*, Band xlvi., Heft 2. *May*, 1843.

ALBUMEN.

The albumen of eggs owes its density, and its adhesive and stringy properties, to the presence and the cohesion of a great number of minute globules. (*Turpin, on the microscopic examination of the globules of milk in a pathological state*). These globules, according to the author, are nothing else than vegetable seeds, which are capable of germinating under the influence of moisture and heat. In a philosophical point of view, the white of egg, in its crude state, may be classed among the most tender and easily

digested vegetables; but it also contains, as is known, a portion of sulphur, and it is this, probably, together with the yolk, that renders eggs so salutary to many convalescents. It has been observed, among other things, that the medicinal effect of eggs is remarkably deteriorated by boiling them with any fatty matter. This effect has been ascribed to the oxidation of the sulphur.—*Annales de Thérapeutique*, August, 1843.

NEW PROCESS FOR PREPARING CYANOGEN.

BY MR. ALEXANDER KEMP.

Take six parts of perfectly dry ferrocyanide of potassium, and nine parts of bichloride of mercury, both in fine powder, and mix them intimately together, then apply heat to the mixture in a glass retort, when cyanogen gas will be disengaged; mercury at the same time distils over, and a dark coloured matter is left in the retort, being a mixture of chloride of potassium and cyanide of iron.—*Philosophical Magazine.*

NEW METHOD OF MAKING AN ALCOHOLIC TINCTURE OF CANTHARIDES.

BY M. RIGHINI.

Take of Cantharides, in fine powder	64	parts.
Nitric Acid	32	"
Alcohol	750	"

Pour the nitric acid over the cantharides, then add the alcohol by small quantities at a time, after the acid has ceased to act on the powder. The mouth of the bottle is now to be stopped, and the ingredients allowed to macerate for eight hours, being, meanwhile, frequently agitated. The tincture is to be pressed and filtered, 750 parts being obtained.

The tincture of cantharides, thus prepared, contains no free nitric acid, for it occasions no effervescence on the addition of carbonate of potash.

In this process, the action of the nitrie acid consists, in the first instance, in promoting, with the concurrence of the heat generated, the solution of the cantharidine. The acid then gradually passes to the state of nitric ether, and this new product combined with the alcohol, still further promotes the solubility of the active principle of the cantharides.—*Journal de Chimie Médicale*

ON THE PREPARATION OF IODIC ACID.

BY M. GROSOURDY.

The author recommends the following process for the preparation of *iodic acid*, as being much more simple and more economical than the methods usually adopted, and, above all, as being very easy of execution.

An iodate of barytes is to be formed by passing a current of chlorine gas, to excess, through a weak solution of chloride of barium, in which is suspended iodine, reduced to fine powder; or, what is better, recently precipitated. The process may be conducted with a Woolf's apparatus, taking care that the tubes, through which the chlorine passes, are of large diameter, and that they do not get blocked up with the iodate of barytes. The current of chlorine should be continued, not only until the whole of the iodine disappears, but until the liquid assumes a greenish-yellow colour. The iodate of barytes will be precipitated at the bottom of the vessel.

The following formulæ will represent the reactions which take place:

$$\mathrm{Cl\,Ba + 1 + 10\,Cl + 6\,H\,O + Aq.}$$
$$= \mathrm{Cl\,H + I\,O_5, Ba\,O + Aq.}$$

The operation being terminated, the iodate of barytes is to be separated, by decantation, from the supernatant liquid ; and, after breaking down the salt in a mortar, it is to be washed with distilled water until the liquid ceases to afford a precipitate with nitrate of silver, or to give any acid reaction. All the insoluble iodates may be obtained by a similar process, if the corresponding chlorides be not decomposable by water. The mixture of chloride and iodine may be replaced by a corresponding iodide, but this modification of the process would not, in most cases, prove economical.

The following formulæ will explain the reactions that would then take place :

$$\mathrm{I\,Ba + 12\,Cl + 6\,H\,O + Aq.}$$
$$= \mathrm{I\,O_5,\ Ba\,O + 6\,Cl\,H + Aq.}$$

Nothing more remains to obtain the iodic acid, than to decompose nine parts of the iodate of barytes, in fine powder, mixed with ten parts of distilled water, by two parts of pure concentrated oil of vitriol, diluted with about twelve parts of water. The mixture is to be boiled, then filtered, and the filtered liquor evaporated in a porcelain capsule to four-fifths its bulk, then allowed to stand in a dry air. The iodic acid will soon be deposited in the crystalline form ; and the mother liquor being further evaporated, will yield a fresh portion of the acid, either in crystals or in mass, according as the solution is more or less concentrated.—*Journal de Chimie Medicale.*

NEW PROCESS FOR OBTAINING CARBONIC OXIDE.

Mr. Fownes, in a paper read before the Chemical Society on the 21st of March, 1843, "On the Action of Oil of Vitriol upon Ferrocyanide of Potassium," describes a convenient method for obtaining carbonic oxide. He says,

"When finely powdered ferrocyanide of potassium is heated in a capacious flask or retort, with eight or ten times its weight of concentrated sulphuric acid, the white pasty mass first produced by the action of the acid upon the salt gradually dissolves and disappears, its solution being accompanied by the disengagement of a prodigious quantity of permanent gas. This gas, when collected over water, is colourless and transparent, it has a very faint garlic odour, does not render lime-water turbid, takes fire on the approach of a taper, and burns with a bright blue flame, generating carbonic acid. When mixed with half its bulk of pure oxygen, introduced into the syphon-eudiometer, and fired by the electric spark, a contraction occurs, amounting to one-third part of the whole, and the residual gas becomes almost entirely absorbable by caustic potash. These characters are sufficient to prove that the gas in question is pure carbonic oxide."

A single half-ounce of the yellow salt treated with some oil of vitriol in a common Florence flask, fitted with a perforated cork and conducting tube, gives more than 300 cubic inches of gas, which has all the marks of the most perfect purity. The gas given off during the whole of the reaction is equally pure, except quite at the end of the operation, when a little sulphurous acid appears.—*Memoirs of the Chemical Society.*

AILMENTS OF SINGERS AND LECTURERS.

Singing, and precipitate or violent talking, cause a determination to the head, and often bring on giddiness and a sense of heaviness ; so that medical men, very justly, forbid much talking, or reading aloud, as being injurious, for patients suffering from any complaint of the head. No exercise tends more to heat the whole body than singing. During this exercise, the whole mass of the blood is strongly agitated (*Ramazzini, on*

the Complaints of Artizans). Singers, especially deep bass singers, are very frequently affected with hernia (*Fallope on Hernia*). All those who use the voice much, in speaking, in reading aloud, or in singing, are subject to agitations of mind (*Hippocrates on Diet*). Musicians confess, that singing heats the blood, and after an opera, the performers are sometimes known to discharge bloody urine (*Ramazzini*). Persons who have occasion to strain the voice, and who wish to preserve it, should frequently use the bath, and should take nourishing but laxative food (*Galen*).—*Annales de Thérapeutique.*

ON THE STATE OF PHARMACY IN GREAT BRITAIN.

BY DR. BUCHNER.

(*Translated from the German.*)

The spirit and energy of the English are directed chiefly towards useful arts, manufactures, and commerce. Under extensive and successful enterprises, carried on for centuries, their national character, their pride, their wealth, and the constitution of their country, have been formed and peculiarly impressed. To these circumstances are to be referred many things among them which are grand and worthy of imitation, together with much that is defective and objectionable. To the unbounded wealth of the English is ascribable the fact, that among them private individuals and corporations, or societies, raise the funds for, and support institutions which in other countries are under the direction of the government. In Great Britain the legislature takes little or no cognizance of many matters which with us are reckoned amongst the most important duties of the national authorities; as, for example, education and *medical practice*. To us Germans it is unintelligible how a university* could have sprung up of late years in London, instituted and supported by a company of shareholders, without the slightest aid of the government. In like manner, the hospitals, medical schools, and colleges, as they now exist, were founded in former times, and have been subsequently supported by corporations. The superintendence of the education, examination, and admission of medical men into practice, as also the maintenance of a medical police, is left to companies or corporations established at different periods, and furnished with numerous privileges, but not yet brought into a proper state of organization, so as to form one systematic whole. We can, therefore, readily comprehend how it happens that ideas of medical police and of the practice of medicine and pharmacy are entertained in that country different from those of every other; and that with time all kinds of abuses have crept in, and became, as it were, venerable. Hence in England greater obstacles present themselves to the removal of evils of this kind than in any other country.

Amongst these antiquated and venerable abuses may be reckoned the mode of studying medicine and conferring the title of Doctor at Cambridge, Oxford, and Dublin; as well as the manner in which the corporation of Physicians (the *College of Physicians*) conducts its examinations and admits the young Physicians as *Fellows*. The sons of rich parents only can virtually become Doctors of Medicine and Members of the College of Physicians, since their study, advancement, and admission into the college, are accompanied with a great expenditure both of time and money. The learned Doctors and Fellows are consequently in England great men, who think it beneath their dignity to undertake surgical operations. They are well paid for their consultations, and, properly speaking, they exist only for the rich and for the public hospitals, from whence they derive large incomes.

The mass of the people, in town and country, when in need of medical

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* The University College in Gower Street is here referred to, not the London University at Somerset House.—*Translator.*

assistance, apply at the Apothecaries' shops, where a separate and peculiar practice has for centuries existed. These *Apothecaries* have assumed the right, not only of dispensing medicines, but of *prescribing* them, and of visiting patients. Since the year 1607 there has existed a distinct corporation, called the *Society of Apothecaries;* but previously to this period the Apothecaries were associated with the *Grocers.*

The necessity of medical advice for those who are not desirous of gaining admittance into an hospital, and are unable to pay a duly qualified Physician, has given rise in England to a peculiar kind of practice by Apothecaries. The demand for medical assistance was further the motive which induced the Apothecary to cultivate not only Chemistry and Pharmacy, but as much knowledge of Medicine, Surgery, and Midwifery as he deemed necessary for his practice. In former times, this pharmaceutical and medical instruction was left to the option and inclination of the Apothecary; but in later times a systematic plan of education and study has been laid down by the Society of Apothecaries. The candidate is now required to have been apprenticed for five years to an Apothecary, and to have been engaged during three sessions in the study of Anatomy, Physiology, Medicine, Materia Medica, Chemistry, Midwifery, Forensic Medicine, &c., before he is permitted to go up for examination. No person is admitted as a Member of this corporation or as a Licentiate, who has not complied with these conditions. This corporation does not bear the title of a *College*, like that of the Physicians, nor are those who are admitted into the society called *Fellows*, but only *Members*. It necessarily follows that these Apothecaries, who not only prescribe in their dispensaries, but visit patients at their residences, and are thence called *visiting Apothecaries*, have little time or inclination to occupy themselves with the preparation of medicinal substances. Hence the Society of Apothecaries in London, has, by subscription or shares, founded a central laboratory, together with a building for their sittings, &c., known by the name of *Apothecaries' Hall*, which we have often had occasion to notice in this Journal. The preparations of this great pharmaceutical manufactory are not only sold in England, but are exported in great quantities to other countries.

As the regular Physicians or Doctors of Medicine do not practise Surgery, a third incorporation of medical men exists in Great Britain, viz., that of the *Surgeons*, who are also educated in the large hospitals, and are examined at one of the *Colleges of Surgeons* in London, Edinburgh, or Dublin. It is the interest of many of these persons to dispense medicines, as many Apothecaries also in the course of their medical studies at the hospitals, devote themselves to Surgery in order to be enabled to practise the whole range of medicine.

The men thus qualified, are styled * *General Practitioners*. It may be easily conceived that the great men, the Doctors of Medicine and the Fellows of the College of Physicians, look down with contempt upon these all-curing and dispensing little folks, and that they are careful not to have their prescriptions sent to the Apothecaries' shops, so that there has of necessity arisen another class of Pharmaceutists, called *Chemists and Druggists*. The name *Pharmacopolist* would be simpler, but it was not chosen, probably because the men of business who undertook to dispense the medicines ordered by the regular Physicians, and who do not engage in practice, like

* Professor Rose, of Berlin, during his sojourn in England, directed his attention to the state of medicine in that country, and has given very interesting communications on that subject. In the posthumous works of Dr. F. W. Becker, we find some interesting remarks on this subject, (*vide* the *Jahrbuch für die Pharmacie*, 1835-36, Band xxxv, abtheilung i, p. 258, &c. &c., and Band xxxvi, abtheilung i, p. l., &c.

the Apothecaries, were originally, and even now general dealers, vending spices, sugar, coffee, tea, perfumery, colour, &c., besides medicines. They have applied themselves to the art of dispensing, and to Chemistry as to a branch of business only, and have set up chemical laboratories without acquiring the scientific knowledge which distinguish the Pharmaceutical Chemists of other countries.

But this numerous body of men, established in the metropolis, and in most of the towns of Great Britain, have latterly began to perceive how far they have remained behind the pharmaceutists of other countries, in their scientific attainments, and to feel how needful science was to them. Their ambition has been at last awakened. Some of them established in London, placed themselves at the head of this body in 1841, to found a new institution, called The Pharmaceutical Society of Great Britain, to establish a School of Pharmacy in London, to introduce a systematic plan of scientific education, and to edit a Journal of Pharmacy.

The Chemists and Druggists of Great Britain, are now in a fair way of placing themselves on a level with the Apothecaries of Germany and France, perhaps of surpassing them, for it is not to be denied that the English follow up with the greatest energy and determination any object they have in view, and that they are not easily led astray, deterred, or confounded in their undertakings. Pharmacy in England being now placed on a proper footing, its practitioners need no longer feel ashamed of their profession, and we may now fairly hope to see it flourish there. In speaking of Mr. Bell's Journal, on a former occasion, we gave an account of the laws and regulations of this newly-formed Society, we have only now to add a few circumstances with which we lately became acquainted.

Bell renounces in a certain degree his British pride, in allowing that the state of Pharmacy in his country is behind that of neighbouring states; and in admitting that English legislation is, in this respect, very defective, and, that it has left much to be desired, which must now be obtained by exertion. The Pharmaceutical Journal says, that a sense of the necessity of reform of the present institutions and state of things, is awakened in all parties, that it is no longer the time to oppose the interference of medical reformers, or to wage a vexatious warfare in defence of existing privileges and abuses, thus sacrificing the respectability of the profession. That this conviction is already widely diffused, is proved by the circumstance, that in 1842 no less than 2000 persons united to form a new independent and honourable corporation, and laid the foundation of a Pharmaceutical Museum, Laboratory, and Library. The Pharmaceutical Society of Great Britain has held its meetings for scientific discussion, at stated periods, has laid down a fixed plan of education and examination, which it has partially brought into operation, has opened a correspondence with learned pharmaceutical societies of other countries, and published, for the benefit of its members, the scientific treatises which have emanated from their own body in a monthly Journal. The Society only admits such Chemists and Druggists as ordinary members, who are occupied exclusively in dispensing and preparing medicines and pharmaceutical preparations. The Grocers as well as the Apothecaries who prescribe and dispense, and the Surgeons, have no claim to become Members of the Society. If an Apothecary wishes to become a Member, he must give proof of not attending patients, and if he had practised before, he must desist from so doing for the future. The English have therefore begun to perceive that the Apothecaries who prescribe and dispense their own prescriptions, are judges in their own cases, and can be subject to no legal control, and that it is a more natural and at the same time a safer plan, to place these two distinct branches in the hands of two different bodies of men, who would thus by entertaining an observance of each other, act as mutual checks.—*Buchner's Repertorium für die Pharmacie.*

LIST OF ACTS OF PARLIAMENT RELATING TO THE SALE OF SPIRITS OF WINE.

9 Geo. II., Cap. 23.—An Act for laying a Duty upon the Retailers of Spirituous Liquors, and for licensing the Retailers thereof.

10 Geo. II., Cap. 19.—An Act for the more effectual preventing the unlawful playing of Interludes within the precincts of the two Universities in that part of Great Britain called England, and the places adjacent; and for explaining and amending so much of an Act passed in the last Session of Parliament, intituled, "An Act for laying a Duty upon the Retailers of Spirituous Liquors, and for licensing the Retailers thereof," as may affect the Privilege of the said Universities, with respect to licensing Taverns, and all other Public-houses within the Precincts of the same.

11 Geo. II., Cap. 26.—An Act for enforcing the Execution of an Act made in the ninth Year of His present Majesty's Reign, intituled "An Act for laying a Duty upon the Retailers of Spirituous Liquors, and for licensing the Retailers thereof."

16 Geo. II., Cap. 8.—An Act for repealing certain Duties on Spirituous Liquors, and on Licences for retailing the same, and for laying other Duties on Spirituous Liquors, and on Licences to retail the said Liquors.

17 Geo. II., Cap. 17.—An Act for granting to His Majesty the Surplus or Remainder of the Monies arisen, or to arise by the Duties on Spirituous Liquors, granted by an Act of the last Session of Parliament, and for explaining and amending the said Act in relation to the Retailers of such Liquors, and for establishing an Agreement with the United Company of Merchants of England trading to the East Indies.

19 Geo. II., Cap. 12.—An Act for granting to His Majesty several Rates and Duties upon Glass, and upon Spirituous Liquors, and for raising a certain Sum of Money by Annuities, and a Lottery to be charged on the said Rates and Duties, and for obviating some Doubts about making out Orders at the Exchequer, for the Monies advanced upon the Credit of the Salt Duties granted and continued to His Majesty by an Act of the last Session of Parliament.

20 Geo. II., Cap. 39.—An Act for granting a Duty to His Majesty to be paid by Distillers, upon Licences taken out by them for retailing Spirituous Liquors.

24 Geo. II., Cap. 40.—An Act for granting to His Majesty an additional Duty upon Spirituous Liquors, and upon Licences for retailing the same, and for repealing the Act of the Twentieth Year of His present Majesty's Reign, intituled "An Act for granting a Duty to His Majesty, to be paid by Distillers, upon Licences to be taken out by them for retailing Spirituous Liquors, and for the more effectually restraining the retailing of distilled Spirituous Liquors, and for allowing a Drawback upon the Exportation of British-made Spirits, and that the Parish of St. Mary-le-Bow, in the County of Middlesex, shall be under the Inspection of the Head Office of Excise.

26 Geo. II., Cap. 13.—An Act for the more effectually preventing the fraudulent Removal of Tobacco by Land or Water, and for the ease of the fair Trader in Tobacco, and for ascertaining the Rates payable for the Portage of certain Letters, and for amending and for explaining the Laws relating to the Sale of Spirituous Liquors by Retail.

27 Geo. II., Cap. 11.—An Act to continue the Duties for Encouragement of the Coinage of Money, and for removing Doubts concerning the continuance of the Duty of Twenty Shillings for every Tun of Brandy, Wines, and Strong Waters imported.

30 Geo. II., Cap. 24.—An Act for the more effectual Punishment of Persons who shall attain, or attempt to attain, possession of Goods or Money by false or untrue Pretences, for preventing the unlawful pawning of Goods, for the easy Redemption of Goods pawned, and for preventing Gaming in Public-houses by Journeymen, Labourers, Servants and Apprentices.

31 Geo. II., Cap. 36.—An Act for continuing certain Laws therein mentioned relating to British Sail Cloth and to the Duties payable on Foreign Sail Cloth; and to the Allowance upon the Exportation of British-made Gunpowder; and to the Encouragement of the Trade of the Sugar Colonies in America; and to the landing of Rum and Spirits of the British Sugar Plantations before the Duties of Excise are paid thereon; and for regulating the Payment of the Duties on Foreign Excisable Liquors; and for the Relief of Thomas Watson, with regard to the Drawback of certain East India Calicoes; and for rendering more commodious the New Passage leading from Charing Cross.

32 Geo. II., Cap. 29.—An Act for further regulating the Power of taking Samples of Foreign Spirituous Liquors by the Officers of Excise, and also for empowering the Traders to take such Samples before the Duties are charged.

33 Geo. II., Cap. 9.—An Act for preventing the excessive use of Spirituous Liquors, by laying additional Duties thereon; for shortening the prohibition of making Low Wines and Spirits from Wheat, Barley, Malt, or other Grain, and from Meal, Flour, and Bran; for encouraging the Exportation of British-made Spirits; and for more effectually securing the Duties payable upon Spirits, and preventing the fraudulent Relanding or Importation thereof.

33 Geo. II., Cap. 28.—An Act for encouraging the Exportation of Rum and Spirits of the Growth, Produce, and Manufacture of British Sugar Plantations from this Kingdom; and of British Spirits made from Molasses.

5 Geo. III., Cap. 46.—An Act for altering the Stamp Duties upon Admissions into Corporations or Companies; and for further securing and improving the Stamp Duties in Great Britain.

32 Geo. III., Cap. 58.—An Act for the Amendment of the Law in Proceedings upon Information in nature of Quo Warranto.

39 Geo. III., Cap. 86.—An Act for ascertaining the Rate of Duty to be paid for Retail Spirit Licences, and for authorizing the Justices of the Peace for any County to grant Licences to sell Ale, Beer, or other Liquors by retail, in Cities and Places where a sufficient number of Magistrates cannot be found qualified to grant such Licences.

48 Geo. III., Cap. 143.—An Act to repeal the Stamp Duties on Licences granted by Justices of the Peace for selling Ale, Beer, and other Excisable Liquors by retail, and for granting other Duties in lieu thereof.

4 Geo. IV., Cap. 125.—An Act for altering the time for holding General Annual Meetings for licensing Alehouses within the County of Middlesex, and for authorizing the Justices of the Peace for the said County to remunerate High Constables.

9 Geo. IV., Cap. 61.—An Act to regulate the granting of Licences to Keepers of Inns, Alehouses, and Victualling-houses in England.

BOOKS RECEIVED.

Braithwaite's Retrospect of Practical Medicine and Surgery. Small 8vo, pp. 312. *Simpkin, Marshall, and Co.*

Gatherings from Grave-Yards, *particularly those of London; with a concise History of the modes of Interment among different Nations, &c. &c.* By G. A. Walker, Surgeon. 8vo. pp. 258. 1839. *Longman.*

The Grave-Yards of London, pp. 48. 1841.

Interment and Disinterment, pp. 28. 1843. By the same Author. *Longman.*

TO CORRESPONDENTS.

W. C. M. (Cheltenham), in answer to a Correspondent of last month, sends the following "Formula for Effervescing Cheltenham Salts, as generally prepared by the respectable Chemists at Cheltenham."—Take 100 gallons of the Cheltenham saline water, No. 4, and evaporate to dryness. To one pound of the anhydrous salt, add two ounces of tartaric acid and two ounces and a half of sesquicarbonate of soda.

"Oj." wishes to have formulæ for Preston Smelling Salts—Brass Polishing Paste—Furniture ditto—Furniture Cream.

"An Associate" wishes to know the composition of Dr. Taylor or Lignum and Son's Antiscorbutic Drops.

"Discipulus."—To clean a counter.—First wash it with water; then apply linseed oil, and rub it. We are not acquainted with any substitute for elbow-grease.

"A Constant Reader" wishes for a simpler method of effacing "Permanent" ink, than any hitherto published. [We think our Correspondent would gain nothing by the information, and might probably lose the sale of his "permanent ink." "*Where ignorance is bliss, 'tis folly to be wise.*"]

L. H. S. "wishes to know by what process he can obtain the active principle of castor oil in powder!" [It would be necessary first to discover the active principle of castor oil.]

Mr. Robert Douglass will probably be able to efface the stains by means of strong liquor ammoniæ, or by scouring them with soap and boiling water.

"Æsculapius" wants an amalgam for stopping decayed teeth.—Gold leaf and mercury are sometimes used for this purpose; but we should recommend gold leaf and a Dentist.

W. F. B.—We do not pretend to be learned in the art of bleaching oils, but believe chloride of lime is not used for this purpose as our Correspondent imagines.

"Spero."—Crystallized Carbonate of Soda, not dried Carbonate of Soda, should be used for testing the strength of acids. The dried soda used by our Correspondent, no doubt, contained water, which being indefinite in quantity falsified the result. There is no recent work in our language on Practical Pharmacy.

"Inquisitor." — Oleum Aurantii and Oleum Limonum are sparingly soluble in spirits of wine. Their solubility may be increased by the addition of camphor. The deposition of a sediment does not of necessity imply adulteration in essence of lemon.

G. F. S.—We are not aware of any *chemical* agent which would produce the effect desired; but common salt being soluble in water, we think it might be got rid of by solution.

R. T. T.—We are not aware of any difficulty in obtaining the iodide of lead in the crystalline form, in the manner described by our Correspondent. The mode of drying the product must depend upon the quantity made.

Chlorate of Strontian is obtained by combining pure strontian with chloric acid.

"A.B."—The dyer's solution of tin is a bichloride. It is used with cochineal in dyeing scarlet.

"J. M."—We know of no means of ascertaining whether potatoes have been fermented with malt in making beer, unless any of the farina be present, which may be detected by the microscope.—It is impossible to say what the regulations for admission into the PHARMACEUTICAL SOCIETY will be two or three years hence.

"X. Y."—(1.) We defer the answer to this question.—(2.) The quality of ipecacuanha must be determined by its sensible characters, and its medicinal effects.—(3.) CACHOU AROMATIZE. Take oil of cloves, ʒiss ; oils of cinnamon and peppermint, of each 15 minims; oil of pimento, 40 minims; extract of liquorice, 3 oz. Mix, and divide into half-grain pellets, and silver them.—(4.) The quality of bees-wax does not depend on the colour.—(5.) Fresh honey is better than old.

"VET."—(1.) The dark colour which a steel knife acquires from rhubarb, is occasioned by the action of the astringent matter aided by atmospheric oxygen.—(2.) The diacetate of lead is not "*the only soluble disalt.*" The disulphate of quina is soluble.—(3) We have never analyzed the atmosphere of a stable.—(4). For the *modus operandi* of "the bleaching gas chlorine," we must refer to chemical works which treat on this subject.—(5.) Associates who joined the Society before July 1st, 1842, are identified as such by the receipts for their subscription.

"A. P. S."—*Hard* soap is ordered in making linimentum saponis.

W. L. (Norwich)—See vol. ii., page 553, of this Journal.

"CHEMICUS."—*Liquor Citratis Potassæ*, is generally made by saturating lemon juice, or a solution of citric acid of the same strength, with carbonate of potash. By diluting this with an equal quantity of water, or any other vehicle that may be preferred, it becomes what is called simple saline mixture, or *Mistura Salina*.

"AN APOTHECARY" in practice as such is not eligible as a member of the PHARMACEUTICAL SOCIETY.

"A STUDENT AT THE COUNTER," under the circumstances mentioned in his letter, should have recourse to books.

"A MEMBER,"who objects to the critical articles of one of our contributors, is reminded, that it is highly necessary to awaken the attention of our Members to the importance of accuracy and uniformity in pharmaceutical preparations. We trust the articles in question will not give offence, as especial care has been taken to avoid personal allusions.

"TURPIN."—In the preparation of cold cream it is desirable to avoid all alkaline salts. Our objection to the bicarbonate of potash would apply with greater force to the carbonate. We did not think it necessary to give the proportions of ingredients in making Bandoline with Irish moss, as these would depend on the consistence required, which is altogether a matter of fancy.

Mr. OWEN.—We think the formula unobjectionable, as published.

"A CONSTANT READER" wants a recipe for Eau de Cologne, and "a remedy for nervous timidity." Dr. Pereira gives the following, on the authority of Trommsdorff:—Oil of neroli, oil of citron, oil of bergamot, oil of orange, oil of rosemary, of each twelve drops; Malabar cardamoms, one drachm; rectified spirit, a pint. Distil.

"AJAX." The word in the prescription is *Bi*sulphatis, not *Vi*sulphatis.

"AN ASSOCIATE" (Dublin).—The colour of compound tincture of cardamoms being derived from cochineal, is discharged by the alkali in the mixture alluded to.

Mr. BARTLETT sends the following recipe for a RED show colour:

℞ Iodinii, ʒij.
Potassii Iodidii, ʒij.
Aquæ distillatæ, ʒj. Misce, dein adde
Aquæ Distillatæ Cong. iij.
Acidi Hydrochlorici, ℥iv. M.

[We have tried this colour, and can recommend it.]

P. A., A.P.S.—(1.) Tncture of sesquichloride of iron is not often administered as a poison. In case of an overdose being taken, the antidote is chalk, magnesia, or soap. (2.) We think Daniell's *Introduction to Chemical Philosophy* would answer our Correspondent's purpose. The second edition has lately been published. (3.) Gray's Supplement is 14*s*. (4.) Prizes at the close of the lectures are in contemplation.

"TYRO."—The root sold as Smilax aspera is derived from *Hemidesmus Indicus*. (See vol. i., page 579). The Syrup may be made in the same manner as Syrup of Sarsaparilla.

LLOYD LLOYD enquires, Should it be two tablespoonsful, or two tablespoonfulls? [Neither:—two tablespoonfuls.]

"IGNOTUS" alludes to the absurd custom of writing "spoonsful instead of the old legitimate plural spoonfuls," observing that "SPOONFUL is a noun substantive singular, and forms its plural, like other noun substantives, by adding the *s*; but if the *s* be added to the first part of the word, the substantive property is taken away, and it is converted into two nouns, a substantive and an adjective." Ignotus pursues his argument in reference to handful, mouthful, &c. The logic of our Correspondent is worthy of a more important subject.

A. E. H. (An Apprentice, Worcester.) Selecta è Prescriptis, 5*s*.; Lindley's Elements of Botany, 10*s*. 6*d*.; Thomson's Dispensatory, 21*s*.—This Journal is exchanged with others on the Continent.—The examination of Apprentices is not particularly formidable.—The diplomas will be ready in time for our Correspondent.

Mr. SETCHFIELD, from his own observation, recommends the drug called Matico (*Piper angustifolium*). (See vol. ii., p. 660) as a styptic, in cases of hæmorrhage either external or internal.

E. G.—(1.) Associates are not prohibited from engaging themselves as *Dispensing Assistants* to Apothecaries. (2.) Probably in some cases. (3.) In a town where the number of persons not Chemists who sell drugs, is to that of the regular Chemists as four to one, we can suggest no remedy but the slow and sure one mentioned in our leading article of this number.

"X. Y. Z."—See vol. ii., p. 481. The examinations of Members and Associates take place in London.

"ʒj."—(1.) Yes. (2.) No—except under particular circumstances.

"A CORRESPONDENT" enquires whether Chemists incur a penalty for selling pepper and vinegar without a licence? [Yes, if sold for culinary purposes. No, if compounded or sold medicinally.]

"F. C.," "A STRAND MEMBER," and "AN APOTHECARY," should send their names. Questions of a private nature ought to be answered privately.

Advertisements to Mr. CHURCHILL, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. SMITH, 17, Bloomsbury Square.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

N.B. Several letters have arrived too late for this month.

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. V.—NOVEMBER 1st, 1843.

ON VOLUNTARY AND COMPULSORY EDUCATION.

In the education of very young children the necessity of coercion is obvious, and the studies of the school-room are not regulated by the will and pleasure of the scholars. Until the reasoning faculties are sufficiently developed to enable the child to appreciate the advantages of learning, a stimulus from without must take the place of that, which, in after years, ought to exist within. But, by degrees, emulation—the desire to obtain the first place in the class, or some substantial mark of distinction, is found to be a more effectual stimulus than even the birch and the flat ruler; and in almost every well-regulated academy may be found boys, of fifteen or even younger, who, in the thirst for fame, devote many hours to voluntary study which their more heedless companions appropriate to youthful relaxation. We have known instances in which this was carried to such an extent, that it was found necessary to enforce, by a strict order, that bodily exercise which the health required—the class being periodically driven from their books, and compelled to run a certain number of times round the playground. The desire to gain a silver medal, or a certificate of merit, being found to operate so powerfully as a stimulus to industry in the schoolboy, it might be anticipated that, on entering upon the business in which his future life is to be spent, the wide field which lies before him would keep up, if not increase, this laudable ambition.

The most important period in his life has arrived; he has embarked in the occupation which circumstances, or his natural disposition and abilities, have pointed out; and it remains for him to apply the preliminary education which he has received to the specific requirements of his profession.

Since his future prosperity, or the reverse, depends entirely on the course which he takes at this particular crisis, it would scarcely appear probable that any young man possessing common sense, and whose mind had been properly directed and trained, would throw away the chance of success which at that period lies within his reach. The prize for which he is about to compete, is not a silver medal or a three-and-sixpenny book; but it is an independence—a station in society—a provision for life.

Compulsory education ought no longer to be necessary; and those young men who have the good sense to consider their future welfare of more importance than present ease and gratification require no restraint or coercion beyond the salutary advice of such friends as may be able, by their experience, to direct their course in the best manner.

But observation has shown that the dispositions, as well as the abilities, of young men are subject to endless variation; and that, although there are some who may safely be trusted under the care of their own discretion, others do not possess this quality to so great an extent as might be expected at their years. Consequently, in those professions in which the exercise of the intellectual faculties is required, and especially where the public welfare or safety is at stake, compulsory regulations are contrived for the purpose of securing the competency of the parties concerned.

In some cases, not only is the amount of qualification defined, but the manner in which the needful education is to be pursued is pointed out, and enforced as strictly as possible. As an illustration, we may mention the case of the Apothecaries. In the first place, an apprenticeship of not less than five years with an Apothecary is indispensable. The candidate must have attained the age of twenty-two. He must produce certificates of having attended, during the space of three years, a certain number of courses of lectures, by approved professors, the number of lectures in each course being pointed out; and he must dissect a certain number of bodies. Unless he can produce evidence that he has complied with these regulations, he cannot be

admitted to examination, and consequently cannot receive a licence to practise as an Apothecary. It would appear therefore *in theory* that an Apothecary, having passed through this severe ordeal, cannot fail to be fully qualified; but it is found *in practice*, that even these regulations are not infallible. The apprenticeship has been in some cases evaded by antedating indentures; and the diligent attendance of lectures is by no means a necessary consequence of paying the fees. The expedient of calling over the names of the pupils at each lecture has been adopted; but even this will not ensure attention during the lecture, nor can individuals be compelled to pursue that course of reading at home which is necessary in order to impress the substance of the lectures on their minds. In fact, it is quite possible for a person to comply in every particular with the strict letter of the Act of Parliament, in reference to the course of education, and yet to be found incompetent when he presents himself to the Board of Examiners.

It is equally true, in the case of the Physician and the Surgeon, that a strict compliance with the educational curriculum will not ensure the complete proficiency of every individual practitioner. However salutary and well-arranged may be the opportunities of instruction which are provided, however rigid may be the laws by which attendance is enforced, no means have hitherto been contrived by which the student can be compelled to apply his mind effectually to his studies, and take full advantage of the facilities which he enjoys.

There can be no doubt, however, that the various changes and modifications which have taken place in the laws regulating the medical profession, since the year 1511, when the first Act was passed, have done much towards the accomplishment of the desired object; and as each successive change has resulted from the apparent necessity of introducing more stringent regulations, we may consider that the arguments in favour of compulsory education are founded on experience.

Nevertheless, the voluntary system has its advocates; and this

system is about to be fairly put to the test in the case of the Chemists and Druggists. The PHARMACEUTICAL SOCIETY was founded for the purpose of effecting that object which, in the case of the Physicians and Apothecaries, was accomplished by Act of Parliament. The Schools of Pharmacy, the Libraries and Museums, the Examinations of Members and Associates, and the Pharmaceutical Journal, have been instituted for purposes of education; and although the powers possessed by the Society are limited to within its own sphere, those who belong to it are obliged to comply with its regulations, and candidates can only be admitted on the terms prescribed by the laws. So long, therefore, as the character and stability of the institution, and the influence which its Members enjoy, furnish inducements to join it, and so long as admission can only be obtained by persons known or certified to be qualified, the natural and inevitable result of its operations will be to raise the standard of proficiency among Pharmaceutical Chemists.

It is true, that attendance at the lectures, as well as adhesion to the Society, is a voluntary act; it does not necessarily follow because Museums and Libraries are established, that the Members and Associates will avail themselves of these advantages; nor is it certain that the Journal will be read because it is forwarded to every subscriber; but it is presumed that those who voluntarily contribute to the support of the Institution are sufficiently impressed with the importance of the measures adopted, to take advantage of whatever opportunities of improvement exist. The progress which the Society has hitherto made exceeds the most sanguine expectations of its projectors, and has been observed with surprise in this country as well as by our brethren on the Continent, who have congratulated us on the attainment of an enviable position in the profession.

Some time, however, may be expected to elapse before all our Members are inoculated with zeal and enthusiasm in the philosophy of their business, and with a desire to possess themselves of that informatiou which would enable them to carry on every process of the shop or the laboratory on correct scientific principles. The

advantage to be derived from Lectures is not yet sufficiently estimated, nor is this likely to be the case, until the examinations at the Society have come into general operation, and the advantage of Pharmaceutical education is demonstrated by the superior credit acquired by those candidates who have availed themselves of the opportunities afforded.

The Lectures at the Institution are designed especially for the Apprentices and Associates. They are delivered at an early hour in the morning, with the view of interfering as little as possible with the business of the day. The subjects and the manner in which they are treated are adapted to the peculiar requirements of the Pharmaceutical Chemist, and the terms, to those who belong to the Society, are very much below the usual scale.

That the Lectures are fully appreciated by those who attend, we have no reason to doubt. Some of the students reside at a considerable distance from the institution—for instance, at Clapham, Deptford, Islington, Chelsea, Brompton, Brixton, &c., and the punctuality observed, as well as the interest which we have heard expressed in the subjects elucidated, afford sufficient evidence that the labour is not thrown away. We regret that these advantages are not shared by a greater number of our Members and Associates; but we feel assured that in process of time the Lecture Room will be more generally resorted to.

The reports from the branch Schools at Manchester, Bath, Bristol, and Norwich are particularly encouraging; and if the same amount of patronage had been extended to the parent School of Pharmacy by our London students, we should have been able to bring forward a most unequivocal and practical argument in favour of VOLUNTARY EDUCATION. Not wishing, however, to be too sanguine, we shall suspend our judgment for the present. The experiment is in progress, and whether the increased zeal and continued support of our brethren will so far uphold and amplify the institution as to realize to the full extent the objects with which it was founded, or whether it will be found necessary to enforce a system of COMPULSORY EDUCATION by Act of Parliament, are questions which time only can solve.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

LECTURE III.

ON THE POLARIZATION OF LIGHT, AND ITS USEFUL APPLICATIONS.

BY JONATHAN PEREIRA, M.D., F.R.S.
HONORARY MEMBER OF THE PHARMACEUTICAL SOCIETY.

[Concluded from page 167.]

SYSTEM IV.

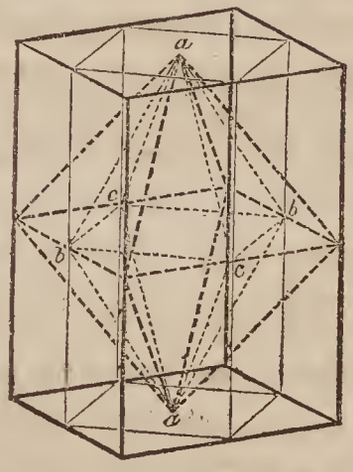
RIGHT PRISMATIC SYSTEM.

Synonymes. — The *right rhombic prismatic*, or *right rectangular prismatic system*, the *prismatic system*, the *two- and two-membered* or *one- and one-axed system*, the *orthotype system*, the *rhombic* or the *holohedric-rhombic system.*

Forms.—In this system are included the *right rhombic prism*, the *right rhombic octohedron*, the *right rectangular prism*, and the *right rectangular octohedron*. Rose enumerates the following forms as belonging to this system:

Homohedral.	*Hemihedral.*
1. Forms whose faces are inclined to all three axes (*Octohedra*).	Rhombic Tetrahedron.
2. Forms whose faces are inclined to two axes, but are parallel to the third (*Prisms*).	
3. Forms whose faces are inclined to one axis but are parallel to the two others (*Single Planes*).	

FIG. 39.



Right Rectangular Prism. | *Right Rectangular Octohedron.*
Right Rhombic Prism. | *Right Rhombic Octohedron.*
a. Principal or prismatic axis. *b b*, *c c*. Secondary axes.

Crystals.—The simple or elementary bodies which crystallize in forms belonging to this system are only three, namely, *iodine*, *native sulphur*, and *selenium*.

Among the binary compounds we have *pyrolusite* (binoxide of manganese), *white antimony* (sesquioxide of antimony), *bichloride of mercury*, *chloride of barium*, *orpiment*, and *grey antimony* (sesquisulphuret of antimony).

A considerable number of salts belong to this system, as the *carbonates of lead*, *baryta*, *strontian*, *potash*, and *ammonia*; the *bicarbonate of ammonia*, and that variety of carbonate of lime called *arragonite*; the *nitrates of potash*, *ammonia*, and *silver*; the *sulphates of magnesia*, *zinc*, *baryta*, and *strontian*, and *bisulphate of potash*; *Rochelle salt* (tartrate of potash and soda) and *emetic tartar* (tartrate of potash and antimony).

To the above must be added the following substances: *topaz*, *dichroite*, *citric acid*, and *morphia*.

Properties.—The crystals of this system present the following properties: they have three rectangular axes all of different lengths: they are doubly refracting with two optic axes; and are tri-unequiexpanding. Consequently they have three rectangular unequal elasticities. On the ellipsoidal hypothesis, their atoms are ellipsoids, with three unequal axes.

They present no crystallographical character by which the *principal axis* can be distinguished from the others called *secondary axes*; so that in a geometrical point of view the choice of this axis is altogether arbitrary. But considered optically the principal axis is the middle point between the two nearest poles of no polarization. It corresponds with what is called by Mr. Brooke the *prismatic axis*; that is, the axis which passes through the centres of the terminal planes of the prism.

If you examine one of the simple or primary forms of this system—say this unmodified rectangular prism (the outer prism of figure 39), you observe there is no single line around which the figure is symmetrical; nor any square plane, or plane which can be inscribed within the circle. But let each of the two opposite terminal edges be replaced by a square plane, both equally inclined to the prismatic axis, and the line which passes through the centre of each of these planes will represent the direction of one of the optic axes.

As the crystals of this system have two optic axes, they present when examined by the polariscope, a double system of rings. In nitre, carbonate of lead, and arragonite, the inclination of these axes is small; and, therefore, both systems of rings may be seen at the same time.

In order to examine these by the polariscope, we must, in the

case of the three crystals just mentioned, cut slices of them perpendicularly to the principal or prismatic axis. But in topaz, right prismatic mica, and Rochelle salt, the inclination of the optic axes is too great to permit both of them to be seen simultaneously; and, therefore, only one of them can be seen at a time. Consequently, if we examine, by the polariscope, a plate of any of these crystals, cut at right angles to the prismatic axis, we must incline it first on one side and then on the other, to see successively the two systems of rings. To obviate this inconvenience, plates of these crystals should be prepared by grinding and polishing two parallel faces perpendicular to the axis of one system of rings.

Nitrate of potash, also called *nitre* or *saltpetre*, ($N O_5 + K O$) is a very instructive crystal for illustrating the double system of rings. It is usually met with in the form of a six-sided prism, with diëdral summits.

For placing in the polariscope, we use plates of from $\frac{1}{12}$th to $\frac{1}{15}$th of an inch in thickness, cut perpendicular to the prismatic axis. If one of these be put in the polariscope in such a position that the plane passing through the optic axis is in the plane of primitive polarization, we shall then perceive a double system of coloured elliptical or oval rings, intersected by a cross, but the centre of the cross is equidistant from the centres of the two systems of rings, so that through the centre of each system passes one arm or bar of the cross, the other arm being at right angles to the former. When the polarizing and analyzing plates are crossed, we have a double system of coloured rings, with a black cross (fig. 40); but when the polarizing and analyzing plates coincide, we have another double system of coloured rings, exactly complementary to the first, with a white cross (fig. 41).

Fig. 40.

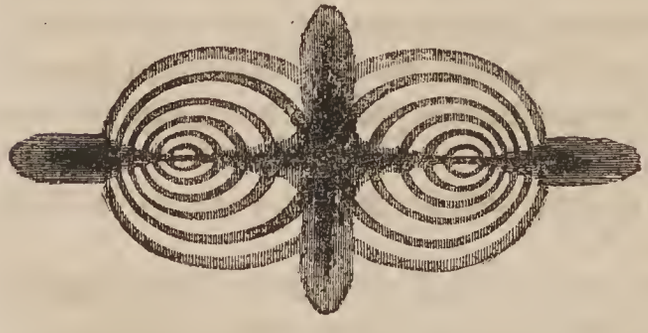


Fig. 41.

If, when the analyzing and polarizing tourmaline plates are crossed, we revolve the plate of nitre in its own plane (both the tourmaline plates remaining unmoved), the black cross opens into two black hyperbolic curves. When the angle of rotation is a

quarter of a right angle, we have the appearance represented by (fig. 42); when it equals half of a right angle, the black arms have assumed the forms of fig. 43.

FIG. 42.

FIG. 43

Here, then, is a remarkable distinction between biaxial and uniaxial crystals, for you will remember I demonstrated that when the uniaxial crystal was rotated in the polariscope, the black cross retained its position and shape.

The variation of form, as well as the general figure of the isochromatic lines, resembles the curve called by geometers the *lemniscate*. The inner rings encircle one pole only, but the outer ones surround both poles. The number of rings which surround both poles augments as we diminish the thickness of the plate of nitre, until all the rings surround both poles, and the system thus greatly resembles in appearance the rings of an uniaxial crystal, from which, however, they are distinguished by their oval form.

I have already stated, that in biaxial crystals the optic axes for different colours do not coincide. In the case of nitre, the axes for red make with each other a smaller angle than the axes for blue. Hence the red ends of the rings are inward, that is, between or within the two optic axes, while the blue ends are outwards, or exterior to the two axes. But as the red rings are larger than the blue ones, it follows that there are points exterior to the axes where all the colours are mixed, or all are absent. At these spots, therefore, the rings are nearly white and black. Now if we trace the same rings to the positions between the axes, "the red rings will very much overshoot the blue rings; and, therefore, the rings have the colour peculiar perhaps to a high order in Newton's scale *."

Native crystallized *carbonate of lead* constitutes a splendid polariscope object. It is to be cut like nitre; that is, perpendicularly to the prismatic axis. The optic axes are but slightly inclined (about $10\frac{1}{2}°$) and therefore both of them may be simultaneously perceived. The systems of rings have a similar form

* Airy, *Mathematical Tracts*, p. 396. 2d ed. 1831.

to those of nitre, and like the latter, the red ends of the rings are inwards, the blue ends outwards.

Arragonite forms an interesting polariscope object. It is identical in chemical composition with calcareous or Iceland spar, but differs in crystalline form: calcareous spar belonging to the rhombohedric, arragonite to the right prismatic system. According to Gustav Rose, both these forms of carbonate of lime may be artificially produced in the humid way, but calcareous spar at a lower, arragonite at a higher temperature. In the dry way, however, calcareous spar alone can be formed.

The inclination of the optic axes of arragonite being small (about 18°) we can easily see, at the same time, the two negative systems of rings surrounding their two poles, but considerably more separated than in the case of nitre. For this purpose, a plate of the crystal is to be cut perpendicularly to the prismatic axis, that is, equally inclined (at about 9°) on each of the optic axes. If we rotate the plate of arragonite on its axis in the polariscope, the tourmaline plates being crossed and unmoved, the two sets of rings appear to revolve around each other. By superposing two plates of arragonite, we obtain four systems of rings.

In *Rochelle salt* (tartrate of potash and soda) the optic axes of the differently refrangible or coloured rays are considerably separated. If a plate of this crystal, cut perpendicularly to the prismatic axis, be inclined first on one side and then on the other, both the systems of rings may be successively perceived. But to observe the separation of the axes for differently coloured rays, Sir J. Herschel directs the plate to be cut perpendicularly to one of its optic axes. If we view the rings with homogeneous light they appear to have a perfect regularity of form, and to be remarkably well defined. With differently coloured lights, however, they not only differ in size but in position. If the light be "alternately altered from red to violet, and back again, the pole, with the rings about it, will also move backwards and forwards, vibrating, as it were, over a considerable space. If homogeneous rays of two colours be thrown at once on the lens, two sets of rings will be seen, having their centres more or less distant, and their magnitudes more or less different, according to the difference of refrangibility of the two species of light employed."

Topaz (a fluosilicate of alumina) belongs to this system. As the inclination of its optic axes is great (about 50°), we can see at once only one of its two system of rings. It slits with facility in planes perpendicular to its prismatic axis, and equally inclined to its two optic axes. If we take a plate cut perpendicularly to

the prismatic axis, and incline it first on one side and then on the other, we shall see successively two systems of oval rings, which have been very elaborately described by Dr. Brewster.

The plates of topaz sold in the opticians' shops, for polariscope purposes, have been obtained by cutting the crystal perpendicularly to one of the optic axes; that is, at an angle of about 25° to the prismatic axis. With these we only see one system of nearly circular rings traversed by a bar or arm of the cross. We observe also, that the optic axes for different colours are somewhat separated; for the red ends of the rings are inwards, or within the resultant axes, while the blue ends are outwards.

The topazes, which are cut for optical purposes, come from Australia, and are technically known as *Nova Minas*. They are colourless and remarkably free from flaws and macles.

Exceptions.—In this system, as in the others, we meet with exceptions to some of the statements above made.

1. Macled crystals, especially of Nitre and Arragonite, are very common. Occasionally idiocyclophanous crystals of nitre are met with. These will be noticed subsequently.

2. *Sulphate of potash* is a tesselated or composite crystal, and as such will be described hereafter.

3. Some specimens of *Brazilian topaz* are tesselated.

SYSTEM V.

OBLIQUE PRISMATIC SYSTEM.

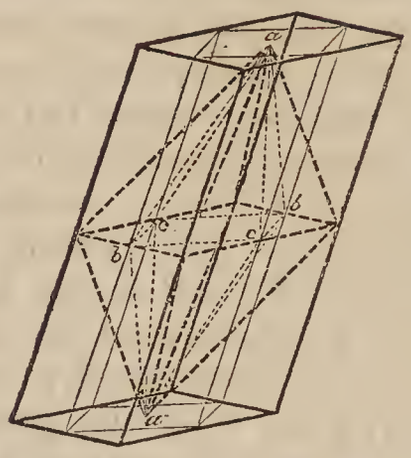
Synonymes.—The *two- and one-membered system*, the *hemiorthotype system*, the *monoklinohedric system*, or the *hemihedric-rhombic system.*

Forms.—To this system belong the *oblique octohedron with a rectangular base*, the *oblique rectangular prism*, the *oblique octohedron with a rhombic base*, and the *oblique rhombic prism.* Mr. Brooke's *right oblique-angled prism* is referred to this system.

Rose makes no distinction between the homohedral and hemihedral forms in this system; but enumerates the following as the forms of the system:

1. Forms whose faces are inclined to all the three axes (*Octohedra*).
2. Forms whose faces are inclined to two axes, and are parallel to the third axis (*Prisms*).
3. Forms of which the faces are inclined towards one axis and parallel to the two others.

Fig. 44.



Oblique Rectangular Prism, Oblique Rhombic Prism, Oblique Rectangular Octohedron, and Oblique Rhombic Octohedron.

a a. Principal axis. *b b, c c.* Secondary axes.

Crystals.—To this system belong the crystals of *sulphur*, when obtained by slow cooling; *realgar* (red sulphuret of arsenic), and *red antimony* (native Kermes).

A considerable number of salts belong here also: as the *sulphates of soda*, *lime* (selenite), and *iron; carbonate* and *sesquicarbonate* (trona) *of soda*, *bicarbonate of potash*, *chlorate of potash*, *phosphate of soda*, *borax* (tincal), the *acetates of soda*, *copper*, *zinc*, and *lead*, *binacetate of copper*, *binoxalate of potash*, *glauberite* (sulphate of lime and soda), and *chromate of lead.*

To this system are also referred *oblique prismatic mica* (one of the kinds of diaxial mica described by Count de Bournon), *tartaric* and *oxalic acids*, *sugar candy*, and the *crystals from oil of cubebs.*

Properties.—The forms of this system have three axes, all of which are unequal. Two of them cut one another obliquely, and are perpendicular to the third. From the forms of the preceding system they are distinguished by this obliquity of two of their axes. As the three axes are unequal, it is indifferent which we take for the *principal axis;* but one of the inclined axes is usually selected, because, in general, the crystals are extended in the direction of one of these, so that in most cases the faces which are parallel to this axis greatly predominate. This axis, therefore, corresponds with that which Mr. Brooke calls the *prismatic axis.* The other two axes are called *secondary axes*. the one which is oblique being termed the first secondary axis; the other, which is perpendicular to it, being denominated the second secondary axis.

The crystals of this system are doubly refracting with two optic axes. They are tri-unequiexpanding, and tri-unequiaxed. On the ellipsoidal hypothesis their atoms are assumed to be ellipsoids with three unequal axes.

In the opticians' shops, plates cut from several crystals of the this system are sold for showing, in the polariscope, the systems of lemniscates. They are usually cut perpendicularly to one of the optic axes; and, therefore, show but one system of rings traversed by a bar. Of these I shall notice three.

Borax deserves especial notice on account of its optic axes for the different homogeneous colours lying in different planes, a fact for the knowledge of which we are indebted to Sir John Herschel. As in other biaxial crystals it will be observed that the rings, or lemniscates, are traversed by only one bar or arm of the cross. In the next place it will be perceived, that the axes for red light make a greater angle with each other than the axes for blue or purple; hence, unlike nitre and carbonate of lead, the red ends of the rings are outwards, while the blue ends are inwards. This fact, however, only proves that the axes for different colours do not coincide: it does not show that they lie in different planes. But if, the tourmaline plates being crossed, the plate of borax be placed at such an azimuth that the bar or arm of the black cross distinctly traverses the centre of the system of lemniscates and leaves an interval perfectly obscure, we shall then see that the arm of the cross is not straight, as in nitre (fig. 40), but has a hyperbolic form. The reason of this difference is obvious: in nitre all the axes lie in the same straight line or plane, while in borax they are disposed obliquely, or in different planes.

Selenite is sometimes cut to show one of its two systems of rings. I have already described this crystal, and demonstrated the uniform tints produced by films of selenite of equal thickness. To show the rings the crystal must be cut at right angles to one of its optic axes.

Sugar Candy makes an interesting polariscope object. This crystal is also cut perpendicular to one of its optic axes, and, therefore, shows only one of its two systems of rings.

Exceptions.—Owing to irregularities of crystallization, the rings of some of the crystals of this system are often seen more or less distorted. Macled selenite is very common, as I have before mentioned. Sir John Herschel states, that idiocyclophonous crystals of *bicarbonate of potash* are frequent. I shall hereafter notice them.

SYSTEM VI.

DOUBLY OBLIQUE PRISMATIC SYSTEM.

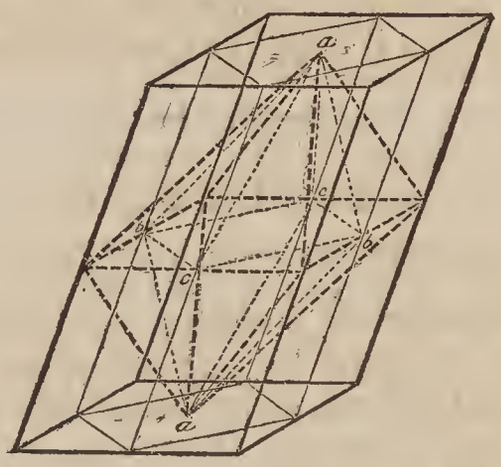
Synonymes.—The *one- and one-membered*, the *anorthotype*, the *triklinohedric*, or the *tetartohedric-rhombic system.*

Forms.—To this system belong the *doubly oblique octohedron*

and the *doubly oblique prism*. Rose makes no distinction of homohedral and hemihedral forms; but arranges the forms of this system as follows:

1. Forms whose faces are inclined to all the three axes. (*Octohedra.*)
2. Forms whose faces are inclined to two axes, and are parallel to the third. (*Prisms.*)
3. Forms which have their faces inclined towards one axis only. These forms are the faces of truncation of the three kinds of angles of the octohedron.

FIG. 45.



Two Doubly Oblique Prisms, and two Doubly Oblique Octohedra.
a a. The Principal Axis. *b b, c c.* The Secondary axes.

Crystals.—The most important substances, whose crystalline forms are referable to this system, are *boracic acid, sulphate of copper*, nitrate of bismuth, sulphate of cinchonia, quadroxalate of potash*, and *gallic acid.*

Properties.—The forms belonging to this system have three axes all unequal and oblique-angular to one another; they are doubly refracting, with two optic axes; and they are tri-unequi-expanding. Consequently they have three unequal elasticities.

Of the three axes just referred to, one is taken for the *principal axis*, the other two for the *secondary axes;* but geometrically considered the selection is altogether arbitrary. The principal axis coincides with Mr. Brooke's *prismatic axis.*

"The forms of this system," says G. Rose, "have not symmetrical faces. All the faces are unique, so that this system is the one which differs the most from the regular or cubic system, in which we find the greatest symmetry on account of the equality and perpendicularity of the axes." It is sometimes exceedingly difficult to distinguish the forms of this system. "The doubly oblique prism," observes Mr. Brooke, "will be found the most

* Mr. Brooke (art. *Mineralogy*, in the *Encyclopædia Metropolitana*), says, that the primary form of Sulphate of Copper is an oblique rhombic prism, and Mr. R. Phillips (*Translation of the Pharmacopœia*, p. 237, 4th edit., 1841) has adopted Mr. Brooke's statement. If this be correct, sulphate of copper of course belongs to the oblique prismatic system, and not to the doubly oblique prismatic system. I have, however, referred it to the latter system on the authority of Gustav Rose, and most of the other eminent German crystallographers.

difficult of all the primary forms to determine from its secondary crystals. It is distinguishable from all other forms, when its crystals are single, by the absence of symmetrical planes analogous to those of other prisms; but it very frequently occurs in hemitrope or twin crystals, which must resemble some of the forms of the oblique rhombic prism, and can then be distinguished only by some re-entering angle or other character on the surface of the crystal."

Sulphate of Copper (Cu O. S O_3. 5 Aq.) is sometimes cut to show the two sets of rings or lemniscates of this system; but the blue colour of the crystal destroys their brilliancy.

LECTURE IV.

4. CIRCULAR POLARIZATION.

The name of *circular* or *rotatory polarization* has been applied to a peculiar modification of light, first observed by Arago in the mineral called Quartz, and whose characteristic and distinctive properties I shall presently point out.

On the wave hypothesis, the term circular or rotatory is peculiarly appropriate, since it is assumed that the ethereal molecules describe circles, in other words that they vibrate or revolve uniformly in circles, and the form of the ethereal wave thereby produced, is that of a spiral or circular helix (that is, to a helix traced round a circular cylinder), of which a corkscrew and a bell-spring are familiar illustrations.

But apart from all hypothetical considerations, the name is an appropriate one. For unlike the rays of common polarized (that is, plane or rectilinearly-polarized) light, those of circularly-polarized light have no distinction of sides, or, in other words, they have "no particular relations to certain regions of space," but present similar properties on all sides, and the angles of reflection at which they are restored to plane polarized light, in different azimuths, are all equal, like the radii of a circle described round the ray.

There are two varieties or kinds of circularly polarized light which have been respectively distinguished by the names of *dextrogyrate* or *right-handed*, and *lævogyrate* or *left-handed*.

In one of these the vibrations are formed in an opposite direction to those in the other. Unfortunately, however, writers are not agreed on the application of these terms; and thus the polarization, called, by Biot, right-handed, is termed, by Herschel, left-handed, and *vice versâ*. There is, however, no difference as to the facts, but merely as to their designation. If, on turning the analyzing prism or tourmaline *from left to right*, the colours descend in Newton's scale, that is, succeed each other in this order—*red, orange, yellow, green, blue, indigo, and violet*, Biot designates

the polarization as *right-handed*, or +, or ; whereas if they descend in the scale by turning the analyzer *from right to left*, he terms it *left-handed*, or —, or . Sir John Herschel, on the other hand, supposes the observer to look in the direction of the ray's motion. Let the reader, he observes, "take a common corkscrew, and holding it *with the head towards him*, let him use it in the usual manner, as if to penetrate a cork. The head will then turn the same way with the plane of polarization as a ray, in its progress *from* the spectator through a *right-handed* crystal, may be conceived to do. If the thread of the corkscrew were reversed, or what is termed a *left-handed thread*, then the motion of the head, as the instrument advanced, would represent that of the plane of polarization in a left-handed specimen of rock crystal."

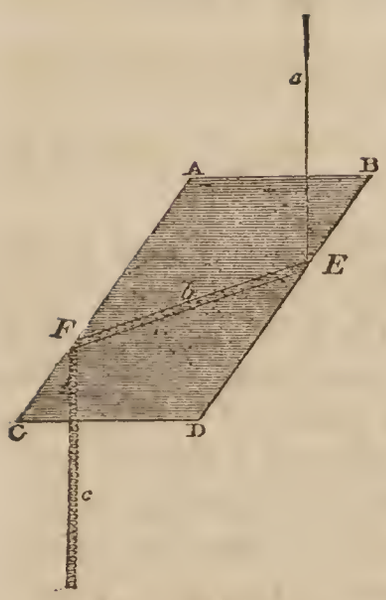
I shall adopt Biot's nomenclature, and designate the polarization right-handed or left-handed, according as we have to turn the analyzing prism to the right or to the left to obtain the colours in the descending order.

In a former lecture I endeavoured to explain the nature of circularly polarized light, according to the wave hypothesis. Powell's machine (see vol. ii. p. 688) gives a very clear notion of the difference between a circular and a plane wave. You may, perhaps, remember that I stated, that a circular wave is composed of two plane waves of equal intensity, polarized at right angles, and differing in their progress one quarter of an undulation. I endeavoured to demonstrate this fact by a machine invented, I believe, by Mr. Wheatstone (see vol. ii. p. 694).

Now, in order that you may comprehend how we effect the circular polarization of light, I must beg of you to keep in mind these statements. Remember, that to convert plane-polarized into circularly-polarized light, two conditions are necessary, namely, 1st, the existence of two systems of luminous waves, of equal intensity, polarized perpendicularly to each other; and, 2dly, a difference in the paths of these two systems of an odd or uneven number of quarter-undulations. Now, whenever these two conditions are satisfied, circularly-polarized light results. But how are we to satisfy them? By so doubly refracting plane-polarized light, that the two resulting waves shall differ in their path an odd quarter-undulation.

There are five modes of effecting the circular polarization of light, that is, of satisfying the conditions above mentioned; but they all agree in acting on the principle now laid down, namely, that by them plane-polarized light is doubly refracted, and two rectangularly polarized waves produced, which differ in their path an odd quarter-undulation.

FIG. 46.



Fresnel's Rhomb.
A. B. C. D. Fresnel's Rhomb.
a. Incident ray of plane polarized light.
b. Depolarized ray.
c. Circularly polarized ray.

1. *Fresnel's Method.*—Fresnel effected the circular polarization of light by means of a parallelopiped of St. Gobin (crown) glass (fig. 46), whose acute angles, *B* and *C*, are about 54°, and consequently whose obtuse ones, *A* and *D*, are about 126°. This apparatus is commonly called *Fresnel's rhomb*. If a ray, *a*, of plane polarized light be incident perpendicularly on the face, *A B*, it will suffer two total internal reflections, at an angle of about 54°, one at *E*, the other at *F*, and will emerge perpendicularly from the face, *D C*. If the first plane, *B D*, of internal reflection, be inclined 45° to the plane of polarization of the incident ray, *a*, the emergent ray, *c*, will be circularly polarized.

Let us now endeavour to explain this phenomenon according to the wave hypothesis.

So long as reflection is *partial*, whether performed at the first or second surface of the diaphanous medium, the incident light suffers only a deviation from its plane of polarization, without having its primitive properties altered, whatever may be the azimuth of its plane relatively to that of the plane of reflection.

But when the reflection is *total* the case is very different. The reflected rays then have, in general, suffered partial depolarization, especially if the plane of reflection is in an azimuth of 45° relatively to the primitive plane of polarization. Now, a ray of light thus modified, or depolarized, as it is termed, may be represented by two rays polarized, the one according to the plane of reflection, the other perpendicularly to it. In other words, the incident-polarized ray (fig. 46, *a*) is resolved by reflection into two rectangularly plane-polarized rays (*b*), the planes of which are inclined respectively, the one 45° to the left, the other 45° to the right of the plane of polarization of the incident ray.

But it is obvious that the reflection of these two rectangularly polarized rays must be effected at different depths, and, therefore, under very different circumstances. The ray whose vibrations are performed parallel to the reflecting surface will glide, as it were, on the surface, and be reflected in a stratum of uniform density; whereas the ray, whose vibrations are performed perpendicularly to the reflecting surface, will penetrate to a greater depth, and pass into strata of varying density. The latter ray will, therefore, suffer a greater retardation than the one whose vibrations are performed parallel to the reflecting surface.

Now when, in the case of Fresnel's rhomb, the plane of the first reflecting surface is in an azimuth of 45° to that of the incident ray,

the retardation is equal to $\frac{1}{8}$th undulation. The same ray is farther retarded another $\frac{1}{8}$th undulation by the second reflection; and now differs in its phase from that of the other ray $\frac{1}{4}$th of an undulation.

Thus are obtained the conditions necessary for the formation of a ray of circularly-polarized light; namely, two plane rays of equal intensity, polarized in planes perpendicular to each other, and differing in their path $\frac{1}{4}$th of an undulation.

2. *Airy's Method.*—If a ray of plane polarized light be transmitted through a lamina of either mica or selenite of such a thickness that, for a ray perpendicular to the lamina (that is, the ray polarized in the plane of one of the principal sections of the mica) the ordinary ray shall be retarded, an odd or uneven number of quarter undulations, as $\frac{1}{4}$th, $\frac{3}{4}$ths, or $\frac{5}{4}$ths (according to the convenience of splitting) more than the extraordinary ray (that is, the ray polarized in the plane of the other principal section), the emergent light will be found to be circularly-polarized. In this case the incident light is resolved into two sets of vibrations, at right angles to each other, and one of these is retarded in its phases more than the other.

Between this and Fresnel's method of effecting circular polarization, there is this difference: in Fresnel's rhomb the retardation of the one ray is nearly the same for all colours, that is, for waves of different lengths. But in the case of the lamina of mica or selenite, the retardation is greater for blue rays than for red rays. "This is seen most distinctly on putting several such laminæ together [in the same crystalline position], when the light which is reflected from the analyzing plate is coloured, whereas, on putting together several of Fresnel's rhombs, there is no such colour. It is plain that in substituting such a lamina for Fresnel's rhomb, the plane of polarization of that ray which is least retarded, corresponds to the plane of reflection in the rhomb."

3. *Dove's Method.*—This consists in transmitting plane polarized light through glass to which a certain degree of doubly-refracting power has been communicated by pressure, or by rapidly heating or cooling it.

I have already shown that well annealed glass acquires doubly refracting properties when compressed; that unannealed glass possesses similar properties; and also that during the time that glass is rapidly heating or cooling it is likewise a double refractor.

Of the two systems of waves which are thus obtained, one is polarized in a plane parallel to the axis of compression, the other in a plane perpendicular to it.

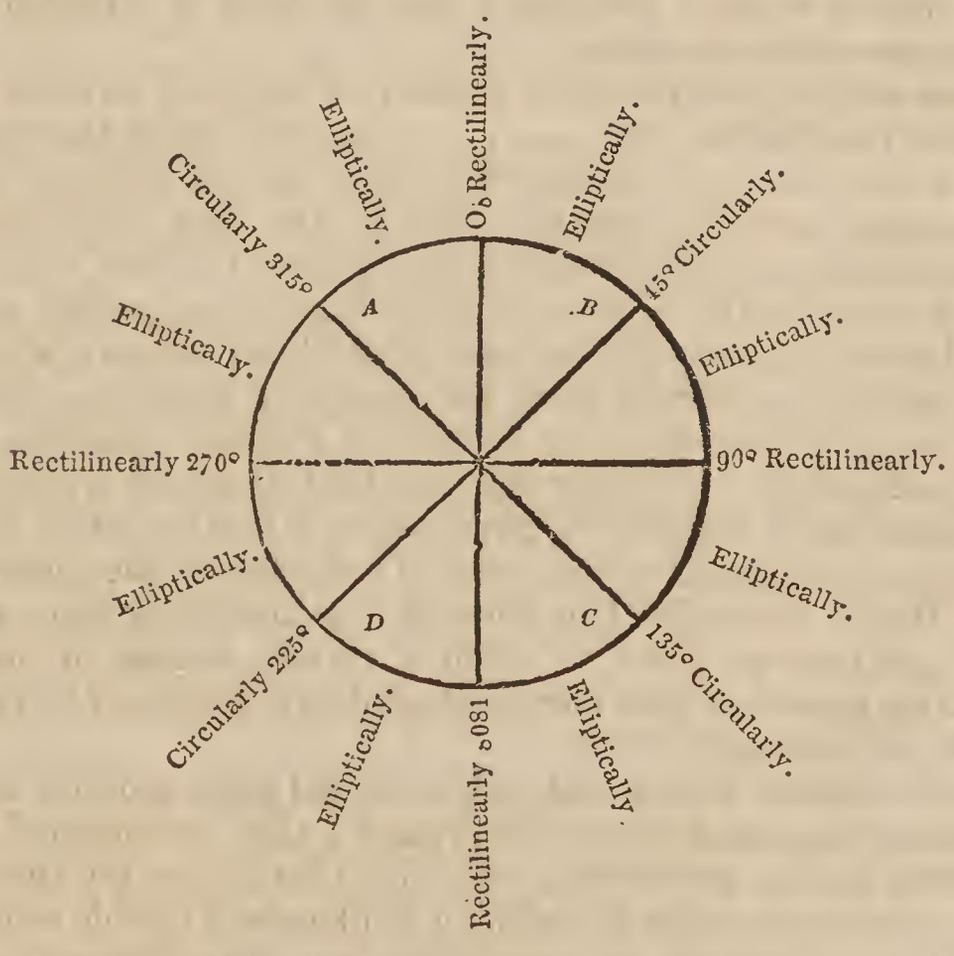
Now, if the degree of doubly refracting power thus communicated to glass be just sufficient to effect the retardation of one of the systems of waves $\frac{1}{4}$ of an undulation, we obtain a structure fitted for converting plane-polarized into circularly-polarized light.

"If a square or circular plate of glass," says Dove, "be compressed so that the axis of compression forms an angle of 45°

or 135° with the plane of primitive polarization, the light passing through the centre of the glass at a certain degree of the pressure will be circularly polarized. During a complete revolution of the plate in its plane round the perpendicular incident ray as an axis of revolution, the light is polarized four times rectilinearly and four times circularly: rectilinearly when the compressing screw acts on the points 0°, 90°, 180°, 270°, that is to say, when the axis of compression is perpendicular to the plane of primitive polarization, or lies within it; and on the contrary, it is polarized circularly when that point of action corresponds to the points of division, 45°, 135°, 225°, 315°, whilst 45°, and 225°, as also 135°, and 315°, exhibit a similar effect."

These statements may be rendered more intelligible by the following diagram:

Fig. 47.



If light, rectilinearly polarized in the plane O° 180°, or in that of 90° 270°, be incident on a circular disk of compressed glass (fig. 47, *A*, *B*, *C*, *D*), the emergent light is rectilinearly polarized when the axis of compression is either O° 180°, or 90° 270°; but is circularly polarized when the axis of compression is either 45° 225°, or 135° 315°. At all intermediate azimuths it is elliptically polarized.

The degree of compression to which the glass is to be subjected, to produce these effects, is such that when the compressed glass is placed in the polariscope, with the tourmalines crossed, a black cross is seen with blond-white vacant spaces in the corners.

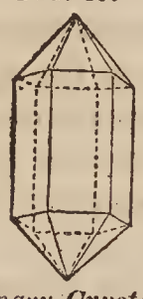
Unannealed glass, possessing the same degree of doubly refracting power, acts in a similar manner to compressed glass.

Annealed glass, while either rapidly heating or cooling, likewise gives rise to similar effects at the time when its doubly refracting power is just equal to that of the compressed glass above described.

4. *Quartz.* — I now proceed to notice the remarkable optical properties of the substance denominated Quartz.

This term, the etymological origin of which is not clearly made out, is applied to some of the crystalline forms of silica. The transparent variety, called *rock* or *mountain crystal*, is the kind used for optical purposes. Very perfect transparent crystals are found near Bristol and in Cornwall, and are called *Bristol* or *Cornish diamonds*. The opticians cut some of the most limpid and large crystals, which usually come from the Brazils, for making lenses for spectacles and eye-glasses, and which they denominate *pebbles*.

Fig. 48.

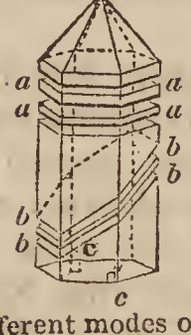


Ordinary Crystal of Quartz.

Quartz belongs to the rhombohedric system. Its most common form is the six-sided prism, terminated by six-sided pyramids (fig. 48). Its fracture is conchoidal.

Now, as quartz belongs to the same system of crystals to which Iceland spar belongs, it might be expected that when we place a plate of it, cut perpendicularly to its principal or prismatic axis (fig. 49 *a a*), in the polariscope, we should observe the cross and a system of circular rings, as in the case of Iceland spar and other crystals of the rhombohedric system. But this is not the case. We do, indeed, observe a system of rings, but the centre of the cross is wanting (fig. 50). Instead of the cross within the inner ring we observe an uniform tint, the colour of which changes when the analyzer is revolved; and, in succession, all the colours of the spectrum are brought into view. But the order of succession (supposing the direction or revolution of the analyzer to remain the same) varies in different crystals. Thus, suppose we turn the analyzer right-handed, that is, as we screw up, the colours succeed each other, either in this order — *red*, *orange*, *yellow*, *green*, *blue*, *indigo*, *violet*, *red* again, and so on; or in the

Fig. 49.



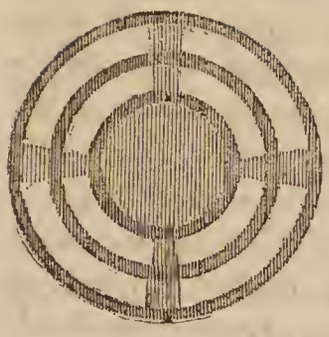
Different modes of slitting quartz for optical purposes:

a a. Plates transverse to the prismatic axis, for showing (in the polariscope) the system of circular rings (fig. 50).

b b. Plates cut obliquely to the axis, for showing the straight bands.

c c. Wedges for making Wollaston's quartz doubly refracting prisms.

Fig. 50.



following order — *red*, *violet*, *indigo*, *blue*, *green*, *yellow*, *orange*, *red* again, and so on. So that to obtain the same order of succession, the analyzer must be turned in the one case right-handed, or as we screw up, in the other left-handed, or as we unscrew. This will be rendered more obvious by the following diagrams:

Fig. 51.

Right-handed.

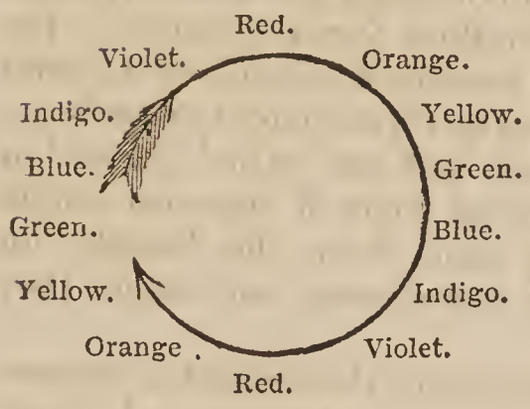


Fig. 52.

Left-handed.

In each of these diagrams the arrow shows the direction in which the analyzer is to be rotated, in order to obtain the spectral tints in the descending order. In one complete revolution of the analyzer each of the colours of the spectrum occurs twice. In other words, all the colours are seen in one semi-revolution of the analyzer.

Hence those specimens of quartz which present the colours in the descending order by a right-handed rotation of the analyzer, are denominated *dextrogyrate*, or *right-handed quartz;* while those which present them by a left-handed rotation are called *lævogyrate*, or *left-handed quartz.*

Fig. 53.

Plagiedral Quartz.

Between these two varieties there has been discovered by Sir John Herschel another difference. In that form of quartz, termed by Haüy *plagiedral* (from πλάγιος *oblique*, and ἕδρα *a base*), it has been found that when the unsymmetrical or plagiedral faces (fig. 53 *x*) lean to the right, the polarization is right-handed, and *vice versâ*, when they lean to the left the polarization is left-handed. So that the cause, whatever it may be, which determines the optical phenomena is also connected with the production of the plagiedral faces.

If, instead of using white light in our experiments, we employ homogeneous light, we find that the plane of polarization of the

incident rays is turned or made to rotate either to the right or left, according as the quartz plate is either right-handed or left-handed. This rotation of the plane of polarization of the incident ray is proportional to the thickness of the plate. The rings produced by thin plates are broader and less numerous than those produced by thick plates. If two plates be superposed the effect is, very nearly, the same as that produced by a single plate whose thickness is either the *sum* or the *difference* of the thicknesses of the two plates; according as they are of the same kind (that is, both either right-handed or left-handed), or of opposite kinds (that is, one right-handed, the other left-handed). Thus, if the rotation of the red rays, effected by a plate of quartz of $\frac{1}{25}$th of an inch thick be equal to $17\frac{1}{2}°$, that produced by two superposed plates of equal thickness, taken from the same crystal, will be $2\times17\frac{1}{2}°=35°$. On the other hand, if we combine a plate of right-handed quartz of $\frac{1}{25}$th of an inch thick with a plate of left-handed quartz of $\frac{4}{25}$ths of an inch thick, the same effects are produced as if we had employed a left-handed plate of $\frac{3}{25}$ths of an inch thick. When the thicknesses of the two dissimilar plates are equal "the plates of course destroy each other's effects, and the system of rings with the black cross will be distinctly seen." (*Brewster*).

The rotation of the plane of polarization increases with the refrangibility of the rays. Thus it is greater with violet than with blue, with blue than yellow, and with yellow than red.

Homogeneous Ray.	*Arc of Rotation.*
Extreme Red	17° 29′ 47″
Limit of Red and Orange	20° 28′ 47″
" Orange and Yellow.....	22° 18′ 49″
" Yellow and Green	25° 40′ 31″
" Green and Blue	30° 2′ 45″
" Blue and Indigo	34° 34′ 18″
" Indigo and Violet	37° 51′ 58″
" Extreme Violet	44° 4′ 58″

I come now to the explanation which the wave hypothesis offers of these phenomena.

When the light, rectilinearly polarized by the first tourmaline plate, is incident on the quartz plate, it suffers double refraction. To prove this, Fresnel contrived a combination of a right-handed prism, and two halves of a left-handed one, by which he doubled the separation of the two rays, and in this way managed to demonstrate the actual existence of double refraction in the principal or prismatic axis of quartz. This is a most remarkable fact. In the principal or prismatic axis of every other known crystal of the rhombohedric system double refraction does not exist.

But the two rays thus obtained differ in their properties from those produced by Iceland spar and other doubly refracting crystals, for while the latter are rectilinearly polarized, those of quartz are circularly polarized. Now every circularly polarized ray is equal to two rectilinearly polarized waves, differing in their progress an odd number of $\frac{1}{4}$ undulations. It follows therefore, that the two circularly polarized waves are equal to four rectilinearly polarized waves. Hence then to explain the phenomena, we must assume that the rectilinearly polarized ray (which I shall call *R*) incident on the quartz, is resolved into two others (*A* and *B*) of equal intensity, the one (*A*) polarized in a plane 45° inclined to the *right*, the other (*B*) 45° inclined to the *left* of the plane of polarization of the primitive ray (*R*). Let us further conceive that each of the two rays (*A* and *B*) is resolved into two other rays, namely *A* into *Aa* and *Ab*, and *B* into *Ba* and *Bb*. *Aa* and *Ab* are polarized in one plane, viz., + 45°, while *Ba* and *Bb* are polarized in another plane, viz.,—45°. *Aa* and *Ba* have each their phases advanced, or + $\frac{1}{8}$ undulation, while *Ab* and *Bb* have each their phases retarded, or —$\frac{1}{8}$ undulation *. Now if we suppose these four rays to be combined two and two in a cross order, we shall have resulting two circularly polarized rays, one right-handed, the other left-handed. Thus *Aa* and *Bb* combine to form a left-handed ray, while *Ab* and *Ba* form a right-handed one. For when the advanced system of waves has its plane of polarization to the right of that of the retarded system, the ethereal molecules rotate from right to left; whereas they rotate from left to right when the first plane is to the left of the second.

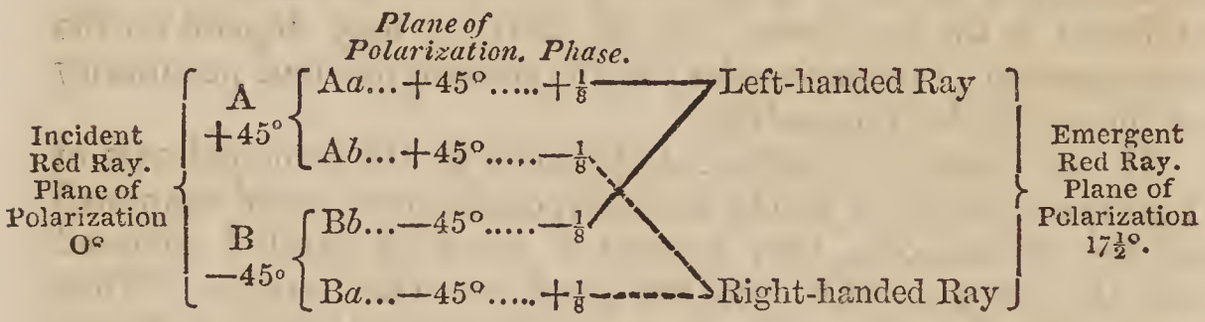
These two circularly polarized rays are propagated along the axis of quartz with unequal velocities. In right-handed quartz, the right-handed ray is transmitted with greater velocity, in left-handed quartz with lesser velocity than the left-handed ray; and thus at their emergence one is in advance of the other. If the surface of egress or ingress be *oblique* to the axis, the two circularly polarized rays will emerge in different directions; but if it be *perpendicular* (as in the experiment under examination) they will emerge superposed, and will compound a single ray polarized

* "It results from the laws of interference," says Fresnel, "that a system of waves, polarized rectilinearly, may be replaced by two others, polarized at right angles to each other, and coinciding in their route; and that for each of these we may substitute two other systems of waves having the same plane of polarization, but the one advanced, the other retarded $\frac{1}{8}$th of an undulation; and thus separated $\frac{1}{4}$th of an undulation. In this way are obtained four systems of waves of equal intensity, of which two, polarized at right angles to each other, are $\frac{1}{4}$th of an undulation behind the two others polarized in the same planes."

in a single plane. Now this plane is removed from the plane of primitive polarization by an angle proportional to the interval of retardation (therefore, proportional to the thickness of the crystal) and to the refrangibility of the ray.

Thus then the differently coloured rays emerge from the quartz plate polarized in different planes; hence, by rotating the analyzer, they are successively transmitted and brought into view.

The following diagram may, perhaps, serve to render more intelligible the explanations of the action of a plate of quartz, of one millimetre (0.03937 of an English inch) in thickness, on the incident rectilinearly polarized red light.



A succession of quartz prisms does not give a further multiplication of images—a circumstance which distinguishes the double refraction of quartz from that of Iceland spar and other crystals.

The above explanation is applicable only when the direction of the rays *coincides* with the principal axis of the crystal. When it is *inclined* to this axis, Mr. Airy has shown that the two resulting rays are *elliptically polarized*, the elliptical vibrations in the two rays being in opposite directions (that is, one right-handed, the other left-handed), and the greater axis of the ellipse is for the extraordinary ray, in the principal plane of the crystal, and, for the ordinary ray, in a plane perpendicular to the principal one. The ratio of the axes in these ellipses, varies with the inclination of the ray to the principal axis of the crystal. When the direction of the ray coincides with this axis, the ratio is one of equality, and the ellipses become circles. But when the ray is inclined to the axis, the ratio increases indefinitely with the inclination. "It is also necessary to suppose that the axis of revolution of the spheroid (prolate for quartz) in which the extraordinary ray is supposed to diverge, is less than the radius of the sphere into which the ordinary wave diverges."

Hitherto we have had no satisfactory theory of the cause of the unequal velocities with which the two rays are transmitted along the principal axis of quartz. We conceive that it must depend either on some peculiarity in the molecules themselves,

or in their mode of arrangement. "The crystal," says Fresnel, "cannot be constituted from right to left as it is from left to right, either in virtue of the arrangement of its particles, or of their individual constitution." If it be a molecular property, it must be acquired in the act of crystallization, by the mutual action of the molecules on each other, for other forms of silica, as well as melted quartz, are devoid of it. An helicoidal arrangement (right or left-handed, as the case may be) of the molecules furnishes a physical explanation of the fact above referred to. It has been objected to this hypothesis, that it is not applicable to the case of circularly polarizing liquids. But as the circular polarization of quartz is dependent on direction, while that of liquids is independent of it, it is tolerably clear that the cause must be different in the two cases. In the first, it may depend on the arrangement of the molecules; in the second, on some peculiarity in the molecules themselves.

If two plates of quartz, cut obliquely to the principal axis of the crystal (fig. 49, *b b*, *b b*), be superposed crosswise and examined in the polariscope, they present a series of parallel coloured bands or stripes, with a central black or white stripe. When the tourmaline plates are crossed, the central stripe is black, when they coincide, it is white. The lateral coloured stripes seen in the one case, are complementary to those seen in the other.

Amethyst is a mixture of right and left-handed quartz, and will be hereafter noticed among tesselated crystals.

5. *Circular Polarization by Fluids.*— Some liquids possess the remarkable property of circularly polarizing light. The following are the most important:

Volatile oils (those of mustard and bitter almonds excepted).
Naphtha.
Aqueous solutions of several kinds of *sugar*, *dextrine*, *tartaric acid*, and *tartrates* (tartrate of alumina excepted).
Diabetic urine.
Albuminous urine.
Alcoholic solutions of *camphor* and *artificial camphor.*
Most *vegetable juices.*

Biot found that vaporization did not destroy the circular polarization of oil of turpentine.

The following liquids have been found devoid of this property:

Water.
Alcohol.
Pyroxilic spirit.
Pyroacetic spirit.
Olive oil.

Volatile oil of mustard.
———————— *bitter almonds.*

Claret (perhaps a trace of).

Champagne.
Citric acid (dissolved in water).
Mannite (ditto).
Liquorice sugar (ditto).
Glycerin.

The apparatus necessary for observing this property of fluids consists essentially of three parts; viz., a polarizer, a tube to contain the fluid, and an analyzer.

The *polarizer* is an unsilvered glass mirror, a bundle of parallel glass plates, or a Nichol's prism. Both Biot and Professor Powell use the first, while Ventzke employs the last. A plate of glass, blackened at the posterior surface, answers very well. Sometimes a second mirror (of silvered glass) is used to throw the light on the polarizing plate.

The *tube*, to hold the liquid, should be from six to twenty-four inches long. In general, it is to be filled with the fluid under examination, and to be closed at each end by a flat glass plate. Professor Powell, however, employs a common test-tube, open at the top, and having the usual hemispherical bottom. In some cases it is desirable to have two or three perforated diaphragms of sheet silver or platinum, placed at intervals in the tube, to exclude the light reflected from the sides of the tube, but to admit those rays which traverse the axis of the tube.

The *analyzer* should be either an achromatic, doubly refracting prism, or a Nichol's prism. Biot uses a doubly refracting prism of calc spar, made of a rhombohedron of this substance, rendered achromatic by replacing a portion of the crystal by a glass prism. Achromatic quartz prisms are objectionable, since they are never so accurately prepared as to yield two images only, but always four; of which two, however, are very faint. Professor Powell employs a rhombohedron of calc spar, in its natural state, as his analyzer, and a lens to magnify the separation of the images. Ventzke uses a Nichol's prism as the analyzer.

The amount of rotation which a ray of light suffers during its passage through the liquid, is measured by an index attached to the analyzer, and moving on a graduated circular metallic plate. Before the tube containing the liquid is introduced, we must fix the zero, or O°. If a doubly refracting prism be the analyzer, the index is made to point to zero, or O°, when the ordinary image alone is seen. If, however, a Nichol's prism be used as ana-

lyzer, the index is arranged to point to O° when the light is excluded; or, in other words, when the light, transmitted by the polarizer, is extinguished by the analyzer.

Homogeneous light is generally employed when we wish to measure the arc of rotation affected by a liquid on a luminous ray. Red light is usually selected, because this is the only homogeneous light which can be isolated by coloured glass. We, therefore, place a plate of red glass between the eye and the analyzer.

If, when the index points to zero O°, the tube containing a circularly polarizing liquid be introduced, the second or extraordinary image immediately becomes evident, if the doubly refracting prism be used as analyzer. By turning the latter round to the right or to the left, as the case may be, this second image disappears (when homogeneous light is used), and the arc traversed by the index from the zero O°, measures the angle of deviation of the ray. If, however, a Nichol's prism be employed, it no longer excludes the light when the index stands at O°, but requires to be rotated a certain number of degrees to do so, and the arc of rotation is here a measure of the rotative power of the liquid.

The explanation of the action of these liquids on the incident rectilinearly polarized light is similar to that already given for the axis of quartz; with the exception, that in the case of quartz, the circular double refraction may depend on the arrangement of the molecules, whereas in liquids it must arise from some property of the molecules themselves.

I proceed now to examine some of the liquids which possess the property of circular polarization:

First, with regard to the *essential* or *volatile oils*. Most of these bodies are circular polarizers: indeed, I know but two exceptions to this statement, viz. oil of mustard and oil of bitter almonds. Some turn the planes of polarization to the right, others to the left, but the intensity of their rotative power varies considerably, as the following table shows:

CIRCULAR POLARIZATION OF THE VOLATILE OILS.

1. *Left-handed,* or *Lævogyrate.*

	Arc of Rotation with the Red Rays through a thickness of 200 *Millimetres.*
Oil of Turpentine	59° 21′
" Mint	32° 28′
" Anise	1° 52′
" Rue	?
Naphtha	15° 21′

2. *Right-handed*, or *Dextrogyrate*

Oil of Lemon	110° 53′
" Bergamot	38° 16′
" Bigarade	157° 89′
" Citron	—
" Limette	—
" Neroli	—
" Fennel	26° 32′
" Caraway	131° 58′
" Lavender	4° 04′
" Rosemary	6° 58′
" Knotted Marjorum	23° 68′
" Sassafras	7° 06′
" Savine	14° 12′

This table is a very instructive one. It shows that isomerism has no connection with circular polarization, for of three isomeric oils (turpentine, lemon, and bergamot) mentioned in this table, one is lævogyrate, the others dextrogyrate. We see also, that oils derived from plants of the same natural family (as the oils of anise, fennel, and caraway from the *umbelliferæ*, and those of mint, lavender, and rosemary from the *labiatæ*) differ in respect of their circular polarization. In some cases, perhaps, this fact might be available to the Pharmaceutical Chemist in detecting mixtures of one oil with another, as the adulteration of oil of peppermint with oil of rosemary, recently mentioned by Mr. Herring. (See *Pharmaceutical Journal*, vol. i., p. 263).

Some kinds of *sugar*, when dissolved in water, yield solutions which have in a greater or less degree the property of rotating the planes of polarization, some to the right, others to the left. Hence polarized light may be sometimes used as a test of the presence of sugar, and the degree of rotation becomes an indication of the quantity and even quality of the sugar present. Biot examined by this test a specimen of sugar-cane juice, and found that it indicated the presence of 20 or 21 per cent. of sugar. Peligot subsequently analyzed it, and found 20.9 per cent. of sugar. Biot, therefore, suggests that those who make, as well as those who refine sugar, might resort to this test as a means of determining the amount of sugar in different juices or solutions. To the colonist it would prove useful by pointing out the saccharine strength of the juice at the mill, and to the sugar refiner it would be valuable by enabling him to determine the absolute strength of raw sugar.

The sugars are prepared for examination by dissolving them in water, and decolorizing the solutions when necessary, by filtering them through purified granulated animal charcoal.

Several sweet or saccharine substances do not indicate any circular polarization, and of those that do, some indicate right-handed, others left-handed circular polarization.

1. Cane Sugar		*Right handed.*
2. Grape Sugar (*Glucose* of Dumas)		*ditto*
3. Incrystallizable Sugar (*Chulariose* of Soubeiran)	*a.* Incrystallizable Sugar of Honey	*Left handed.*
	b. Incrystallizable Sugar, obtained by the action of acids on Cane Sugar	*ditto.*
	c. Incrystallizable Sugar of the juices of Fruits	*ditto*
	d. Incrystallizable Sugar, obtained by the alteration of Cane Sugar. This constitutes the greater part of Molasses	*ditto.*
4. Mannite		O
5. Glycerin		O
6. Liquorice Sugar		O

The grape sugar referred to in this table exists ready formed in honey, and in diabetic urine. It is deposited when the acidulous juices of fruits have been saturated and sufficiently concentrated. Moreover, it is produced by the action of diastase on starch, as well as when syrup, obtained by the action of weak acids on starch or sugar, is abandoned to itself.

The following table, taken from a memoir, by Biot, shows the extent of rotatory power possessed by different sugars:

ROTATION OBSERVED WITH RED GLASS THROUGH A SOLUTION OF 152 MILLIMETRES IN LENGTH.

		Proportion of Sugar in one of the solution.	*Arc of Rotation*
Sugar Candy	1. Aqueous solution	0.25	23° 28′ 45″
"	2. "	0.50	51° 28′ 45″
"	3. "	0.65	70° 11′ 15″
Cane Sugar syrup, boiled, and rapidly cooled		0.244	16° 50′ 33″
Sugar of Milk, crystallized (aqueous solution)		0.14	10° 21′ 40″
Starch Sugar, white grains (ditto)		0.648	48° 30′ 0″
Grape Sugar syrup		—	— — —
" in white grains (aqueous solution)		0.1558	— — —
Crystallizable principle of Honey		0.34201	16° 47′ 30″
Uncrystallizable ditto		—	— — —

Cane sugar, dissolved in water, causes *right*-handed polarization. A strong syrup made with refined sugar shows the

colours most brilliantly. When this kind of sugar is subjected to heat, especially in contact with acids, it loses its crystallizability, and then acquires *left*-handed polarization. In the manufacture of barley-sugar, hardbake, &c., the makers of these kinds of hard confectionary use a little cream of tartar to destroy the crystallizability of sugar. Soubeiran found that a syrup of cane-sugar heated by a salt-water bath, the air being excluded, underwent a series of remarkable changes in respect of its rotative power.

	Arc of Rotation for mean Yellow Ray for a length of 100 *Millimetres.*	
Syrup, primitive	+71	
" After twenty hours	0	
" After twenty-five hours	—11	
" After sixty-four hours	0	
" After seventy-two hours	+ 5	

Here then it appears, that cane-sugar gradually lost its rotative power O°, and then became . In this latter state it was probably incrystallizable sugar. But this in its turn lost its rotative power O°, and became . The precise nature of the latter kind of sugar is not known.

In sugar-refining the object is never to let the syrup get beyond the first zero; that is, not to convert crystallizable unto uncrystallizable sugar. Raw sugar contains, however, both crystallizable and uncrystallizable sugar: the latter alone should constitute treacle. But, from Soubeiran's optical examination, it appears that treacle contains a portion of crystallizable sugar.

The optical characters of sugar have been made use of to detect fraud in Pharmacy. In 1842, more than a ton of a substance purporting to be *manna* was offered for sale in Paris at less than fivepence per pound, the excuse given for the unusually low price was, that cash was immediately required. Suspicion was raised, and the substance was submitted to careful examination, the result of which was the establishment of the fact, that it was not manna, but potato-sugar. Its aspect, taste, fermentability (mannite not being fermentable), and the presence of sulphate of lime proved this. Biot submitted it to a very careful optical examination, and found its characters to be those of a starch-sugar. Manna contains two kinds of saccharine matter, one called *mannite*, and the other a *fermentable sugar*. Now mannite, when pure, has no rotative power on polarized

light, but commercial manna has a slight effect, owing to the presence of a small quantity of fermentable sugar. This fictitious substance, however, had the same effect on plane polarized light, as sugar prepared by the action of acids on starch, when the action is arrested at the first phase of its transformation.

Vinous fermentation has been studied by the aid of polarized light. Take a solution of cane-sugar which has *right-handed* circular polarization. As soon as it begins to ferment it loses this property, but acquires *left-handed* polarization.

Polarized light has been prepared and used as a test of the presence of sugar in urine. To render diabetic urine available for this purpose, it must be decolorized by agitation with fresh prepared granulated animal charcoal, and subsequent filtration. The process is troublesome, tedious, and can only prove successful in the hands of persons familiar with the phenomena of polarized light. With all due deference to Biot, I do not think it will ever prove of much value in practical medicine. We have other, simpler, less laborious, and cheaper methods of detecting sugar in urine than the one now referred to. Moreover, it should be remembered, that albuminous urine possesses the property of circular polarization.

The substance called *dextrine* is starch-gum, and is soluble in water. It is usually prepared from potato-starch, either by torrefaction or by the action of a small quantity of nitric acid. A solution of it possesses the property of right-handed circular polarization, hence the name *dextrine* applied to it by Payen and Persoz.

Properties of circularly-polarized Light.—Common, rectilinearly polarized, and circularly polarized, lights are undistinguishable by the eye. All three may be coloured or white. The properties which distinguish the latter from the two former are as follows:

1. A ray of circularly-polarized light is capable of reflection by a reflecting plane, as of glass, in every azimuth of the plane of reflection. For the circular vibrations of the ethereal molecules may be resolved into two equal rectilinear vibrations, one parallel, the other perpendicular, to any arbitrary plane.

By this property, therefore, circularly-polarized light differs from rectilinearly polarized light, but agrees with unpolarized light.

2. A ray of circularly-polarized light is capable of transmission through a plate of tourmaline (cut parallel to the axis of the crystal), in every azimuth of the axis of the crystal. For in this case also, the circular vibrations of the incident ray may be resolved into two equal rectilinearly vibrations, one parallel, the other perpendicular, to any azimuth. One of these vibrations is transmitted by the tourmaline, the other is suppressed.

In this property also circularly-polarized light agrees with common or unpolarized light, but differs from rectilinearly polarized light.

3. Analyzed by a doubly refracting prism of Iceland spar, a ray of circularly-polarized light gives constantly two equal images, in whatever plane the principal section of the prism be placed. For, as I have already stated, a ray of circularly-polarized light is the resultant of two rays placed at right angles and differing in their phase by a quarter undulation; and, therefore, it must give equal images by the doubly refracting prism, in the same way that common or unpolarized light does, for the difference of phases has nothing to do with this character.

In this respect circularly-polarized light agrees with common or unpolarized light; but is distinguished from rectilinearly (plane) polarized light, which in certain positions (before specified) yields one image only.

4. By two total internal reflections in the interior of glass, at an angle of about $54\frac{1}{2}^{\circ}$, circularly polarized light is converted into rectilinearly polarized light. Thus if light circularly-polarized be incident on Fresnel's rhomb, it emerges rectilinearly polarized, and the position of the plane of polarization at emergence makes an angle of $+45^{\circ}$ or -45°, with the plane of reflection according as the incident light was right-handed or left-handed. This experiment may be readily understood from the explanation already given of the action of Fresnel's rhomb in converting rectilinearly-polarized light into circularly-polarized light (fig. 46, p. 209). In fact, the two experiments are the converse of each other; the light called *incident* in the one case, being termed *emergent* in the other, and *vice versâ*.

In this character, circularly-polarized light differs equally from both unpolarized and rectilinearly polarized lights. For by two reflections of this kind, common light suffers no obvious change; while rectilinearly polarized light, under the same circumstances, is converted into circularly-polarized light, provided that the plane of reflection be at an azimuth of 45° to that of primitive polarization.

5. If a ray of circularly-polarized light be transmitted through a thin film of a doubly refracting crystal, and the emergent light be analyzed by a doubly refracting prism, two rays of complementary colours are produced.

In this character, circularly polarized light is decidedly different to common or unpolarized light, which when submitted to the same examination presents no colour. Rectilinearly polarized light, however, agrees with the circular light in producing complementary tints; but they are not the same in the two cases; those produced by circular light differing from those of rectilinear

light by an exact quarter of a tint, either in excess or defect, as the case may be.

To illustrate these facts, place a film of selenite, of uniform thickness, in the polariscope, and observe the tint which it yields by rectilinearly polarized light. Then interpose, between the polarizing plate and the selenite film, a circularly polarizing apparatus (as Airy's mica plate, or Fresnel's rhomb), and the tint seen by the analyzer immediately changes.

If a plate of calcareous spar, cut to show the circular rings and cross by rectilinearly polarized light, be placed in the polariscope, and circularly polarized light be used, we observe a system of rings and a cross (fig. 53), but which are very different to those seen by rectilinearly polarized light.

FIG. 53.

Rings and Cross of Calc Spar produced by circularly-polarized light.

The rings are divided into quadrants by the cross, every other quadrant being similar, while the adjacent ones are dissimilar. The rings appear to be abruptly and absolutely dislocated, those in the two alternate quadrants being pushed outwards or from the centre, by $\frac{1}{4}$ of an order, and those of the intermediate quadrants being as it were pulled inwards by $\frac{1}{4}$ of an order. Instead of a black cross, we have a luminous one, the intensity of its light being uniform, and about equal to the mean intensity. If the plane of incidence pass through 135° and 315°, the phenomena of adjacent quadrants are exactly interchanged. But the most important difference produced by circularly polarized light, is, that no alteration is made by turning the analyzing plate round the incident ray.

If a plate of a biaxial crystal, as of nitre, be examined by circularly polarized light, we observe the double system of rings, but the black cross disappears. Every alternate semicircle of rings presents the appearance of dislocation.

The origin of the tints produced by circularly polarized light, have been so clearly and concisely explained by Sir John Herschel, that I cannot do better than use his words :

"When," says this eminent philosopher, "a ray propagated by circular vibrations is incident on a crystallized lamina, it may be regarded as composed of two ; one polarized in the plane of the principal section, the other at right angles to it, of equal intensity, and differing in phase by a quarter undulation. Each of these will be transmitted unaltered ; and, therefore, at their emergence, and subsequent analysis, will comport themselves in respect of their interferences, just as would do the two portions of a ray primitively polarized in azimuth 45°, and divided into two by the double refraction of the lamina; provided that a quarter undulation be added to the phase of one of these latter rays. Now, such rays will produce, by the interference of their doubly refracted positions, the ordinary and extraordinary tints due to the interval of retardation within the crystallized lamina. Hence, in the

present case, the tints produced will be those due to that interval, *plus* or *minus* the quarter of an undulation added to, or subtracted from, the phase of one of the portions; and, consequently, will differ one-fourth of a tint in order from that which would arise from the use of a beam of ordinary polarized light, incident in azimuth 45° in the lamina."

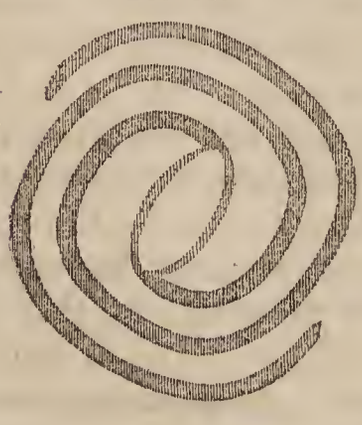
6. If a ray of circularly-polarized light be transmitted through a column of syrup or oil of turpentine, lemon, &c., and then analyzed, either by a Nichol's prism, or a doubly-refracting prism, no colour is produced. For the circular wave is propagated along the liquid without suffering subdivision, and, therefore, at its emergence, no colour can be produced by the analyzer.

In this character circularly-polarized light agrees with common or unpolarized light; but differs from plane polarized light.

7. "Circularly-polarized light," says Fresnel, "differs from plane-polarized light in not sensibly developing colours in plates of quartz perpendicular to the axis." According to the wave hypothesis this ought to be the case; for "a ray propagated by circular vibrations, when incident on rock crystal in the direction of the axis, will (by hypothesis) be propagated along it by that elasticity which is due to the direction of its rotation, the wave then will enter the crystal without further subdivision, and there will be no difference of paths or interfering rays at its emergence; and, of course, no colours produced on analyzing by double refraction."

I confess, however, I have not been able precisely to verify this statement, though, I doubt not, my failure has arisen from some defect in the apparatus used to produce circular-polarization. I have always found a very feeble tint of colour in the axis. As Mr. Airy has very accurately described the phenomena which I myself have repeatedly seen, I prefer quoting his words:

FIG. 54.



Spirals of Quartz, produced by circularly-polarized light.

"If circularly-polarized light pass through the quartz, on applying the analyzing plate, instead of rings, there are seen two spirals mutually enwrapping each other [as in fig. 54.]. If the [Fresnel's] rhomb be placed in position 135°, the figure is turned through a quadrant. If the quartz be left-handed, the spirals are turned in the opposite direction. The central tint appears to be white. With the rhomb which I have commonly used (which is of plate-glass, but with the angles given by Fresnel for crown-glass), there is at the centre an extremely dilute tint of pink: I think it likely that this arises from the error in the angles, as the intensity of the colour bears no proportion to that in other parts of the spiral."

If a plate of right-handed quartz be superposed on a plate of left-handed quartz of equal thickness, and examined by circularly-polarized light, the left-handed slice being nearer to the

polarizing plate, we observe, by means of the analyzer, four spirals (proceeding from a black cross in the centre) which cut a series of circles at every quadrant. At some distance from the centre the black brushes are seen. If the right-handed slice be nearer the polarizing plate, the spirals are turned in the opposite directions.

8. Mr. Earnshaw inferred, theoretically, from Fresnel's formulæ, that if right-handed circularly-polarized light be incident nearly perpendicularly upon a plane surface of glass, the reflected light will be left-handed circularly-polarized, and *vice versâ*. The Rev. Professor Powell has subsequently verified experimentally Mr. Earnshaw's theoretical deduction.

Airy's analyzer for Circularly-Polarized Light.—I have already stated and described two kinds of circularly-polarized light; the one called right-handed, the other left-handed. To distinguish them, Mr. Airy contrived an analyzer which suppresses one and transmits the other. "It is well known," he observes, "that if circularly-polarized light is incident on Fresnel's rhomb, it emerges plane-polarized, and the position of the plane of polarization at emergence makes an angle of +45°, or —45° with the plane of reflection, according as the incident light was right-handed or left-handed. Let the light emerging from the rhomb be received on an unsilvered glass at the polarizing angle, whose plane of reflection makes the angle +45° with that of the rhomb. Now it is plain that if the light incident on the rhomb was right-handed, it becomes plane-polarized in the plane of reflection of the glass, and, therefore, is wholly reflected; if it was left-handed, it becomes plane-polarized in the plane perpendicular to the plane of reflection of the glass, and, therefore, is wholly suppressed." It is then obvious, that this combination of Fresnel's rhomb and on unsilvered glass at +45°, or —45°, would form an analyzer for circularly-polarized light. But as Fresnel's rhomb is inconvenient, on account of its length, Mr. Airy has substituted "a plate of mica of such a thickness that the ray polarized in the plane of one of its principal sections is retarded either $\frac{1}{4}$th, $\frac{3}{4}$ths, or $\frac{5}{4}$ths of a wave (according to the convenience of splitting) more than that polarized in the plane of the other. The mica being attached to the unsilvered glass, so that its principal section makes an angle of 45° with the plane of reflection, an analyzer is produced, which answers the same purposes, in general, as that described above."

6. ON ELLIPTICAL POLARIZATION.

Time will permit to say a few words only respecting elliptically polarized light.

If two systems of waves of equal intensity, polarized rectangularly to each other, differ in their progress a fractional number of $\frac{1}{4}$ undulation, the vibratory movements of the ethereal molecules will be neither rectilinear nor circular, but elliptical. The waves formed by such vibrations will be elliptical, and may be compared to an elliptical helix (that is, to a helix traced round an elliptical cylinder), right-handed or left-handed, as the case may be.

Powell's machine gives a very good idea of elliptical vibrations and elliptical waves.

The manner in which two rectangularly polarized waves interfere and produce elliptical waves, is shown by Wheatstone's apparatus.

There are several modes of effecting the elliptical polarization of light. If in the experiments with Fresnel's rhomb (see *Circular Polarization)* the planes of polarization and incidence be at any other angle than 45° the emergent ray will be elliptically polarized.

Airy's mode of producing circular polarization may be used to obtain elliptical light; but the mica plate, through which the ray is perpendicularly transmitted, must be placed at an azimuth between that which yields circularly polarized, and that which admits plane polarized light.

Compressed, or unannealed glass, also yields elliptically polarized light, under conditions which I have explained when describing Dove's method of circular polarization.

Quartz also produces elliptical polarization when the direction of the incident ray is inclined to the axis.

By reflection from metallic surfaces light becomes elliptically polarized. The elliptical light reflected from silver is nearly circular, while that from galena is almost plane: that is, the ellipsis in the one case is nearly a circle, in the other nearly a straight line.

Elliptically polarized light is not distinguishable, by the eye, from other kinds of light. If it be analyzed by a Nichol's prism, an unsilvered glass mirror, or a plate of tourmaline, it never vanishes during the revolution of the analyzer. By this it may be known from rectilinearly polarized light. But at different azimuths of the analyzer the intensity of the light varies; and by this it may be known from both unpolarized and circularly polarized light. If it be analyzed by a rhombohedron of calc spar, it gives two images in all positions of the analyzer. In this respect it differs from plane polarized light. But one of the images exhibits a defalcation of light, showing that the incident light is not common or unpolarized. If elliptically-polarized light be transmitted through an uniaxial crystal (as

Iceland spar) cut perpendicularly to its axis, and the emergent light be afterwards analyzed, it presents a system of rings and cross different to those obtained from either plane or circularly-polarized light.

The preceding are some only of the peculiarities which distinguish this from other kinds of light; and in conclusion, I may observe, that elliptical polarization forms a connecting link between plane and circular polarization.

5. MACLES AND COMPOUND CRYSTALS.

I have now arrived at the last part of my subject, viz., the consideration of the optical properties of those remarkable crystalline structures commonly known by the name of *macles*, a term introduced into mineralogy by Romé de Lisle. Sometimes these structures appear to consist of one crystal, whose parts are transposed, dislocated, or displaced. When one-half of the crystal appears to have been turned partly round on an imaginary axis, passing through the centre of the crystal, and perpendicularly to the plane of section, and to have been united to the other half in this position, the body thus produced has been called the *hemitrope* (from ἡμι *half* and τρέπω *I turn*). Of this arrow-headed selenite is a familiar example. Sometimes two or more crystals are found intersecting each other, and are then called *intersecting crystals*. When two crystals are joined, they form the structure called a *twin* or *double crystal*.

Many or most of the forms I have now referred to are irregular, and might appear to be accidental. But there are some others which have great regularity, and cannot be ascribed to accident. Such are some specimens of apophyllite and sulphate of potash. They constitute what Dr. Brewster has termed *tesselated* or *composite crystals;* the real structure of many of which is only discoverable by the aid of polarized light; they consist of several crystals, or portions of crystals, juxtaposed, or united so as to form a compound crystal, the figure of which is very different from that of the crystals composing it.

Macled crystals of *nitre* and *arragonite* are very common, and frequently their precise structure is undiscoverable by the naked eye.

In *quartz* we often find right and left-handed crystals intersecting each other.

Amethyst (by many mineralogists considered to be a variety of quartz), is a remarkable example of a combination of right and left-handed varieties of quartz. If a plate of amethyst, cut perpendicularly to the principal axis of the crystal, be examined by the polariscope, it presents a striped or fringed appearance,

variegated with the most gorgeous and brilliant tints. This is owing to its being composed of alternate minute strata of right and left-handed quartz, whose planes of polarization are parallel to the principal axis of the prism.

Topaz sometimes presents a remarkably composite structure. It belongs to the right rhombic system, and presents, when regularly formed, two systems of rings. Cut at right angles to the axis it often presents a central rhomb, "surrounded by a border in which the optic meridians of the alternate sides are inclined at a quarter of a right angle to that of the central compartment, and half of a right angle to each other. In consequence, when such a rhombic plate is held with its long diagonal in the plane of primitive polarization, two opposite sides of the border appear bright, the other two black, and the central compartment of intermediate brightness. Such specimens often present the phenomena of dichroism in the central compartment, while the border is colourless in all positions*."

Sulphate of potash is composed of six crystals belonging to the right prismatic system, joined so as to form a single or double six-sided pyramid, and simulating the crystals of the rhombohedric system. When, therefore, we put a slice of it, cut at right angles, to the axis of the pyramid, in the polariscope, we observe not a circular cross and rings, but a tesselated structure.

One variety of *apophyllite*, called *tesselite*, presents a remarkable structure of the same kind; but its phenomena are still more extraordinary. Apophyllite is composed principally of silicate of lime, with a little silicate of potash. It crystallizes in right square prisms. Plates cut transversely to the axis, and examined by polarized light, appear to consist of nine crystals contained within a number of parallel veins or plates. The central crystal has only one axis of no double refraction, the others two. (See p. 68).

Analcime or *Cubizite* is another remarkable crystal. It consists principally of silicate of alumina with silicate of soda. It crystallizes in the form of the cube, or some form allied to this, as the icosatetrahedron. Instead of being without double refraction, as cubical crystals usually are, it presents a number of planes of no double refraction. It is, therefore, a compound crystal, that is, is composed of a number of crystalline parts disposed symmetrically. (See p. 66).

And here also may be noticed what has been called *interrupted Iceland spar*. Some specimens of Iceland spar give four or even more images, which sometimes exhibit complementary tints. They owe this property to the presence of one or more intersecting

* Herschel, *Encycl. Metrop.*

or interrupting films or strata of the same substance, placed perpendicularly to the short diagonal of the faces of the crystal. This film acts like the depolarizing plate in the polariscope, while the two portions of the crystal between which it is placed, act, the one as the polarizer, the other as the analyzer of the polariscope. Crystals like these, which thus exhibit their colours and rings *per se*, that is without the polariscope, have been called by Sir John Herschel, *idiocyclophanous* (from *ἴδιος proper*, *κύκλος a circle*, and *φαίνω I appear*). Similar phenomena are sometimes exhibited by crystals of *nitre*, and still more frequently by *bicarbonate of potash*.

THE SCHOOL OF PHARMACY.

THE INTRODUCTORY LECTURE,

Of which the following is an abstract, was delivered by Dr. Pereira, on Wednesday evening, September the 27th. After an allusion in general terms to the several courses of lectures which would be delivered in the establishment of the PHARMACEUTICAL SOCIETY, he proceeded to divide *Materia Medica*, or *Pharmacology*, into three branches:

1. *Pharmacognosy*, or *Pharmacography*.
2. *Pharmacy*.
3. *Pharmacodynamics*.

Pharmacognosy (from *φαρμακον*, *a medicine*, and *γιγνώσκω*, *to know*), also called *Pharmacography*, *Pharmacomathia*, or *the History of Simple Drugs*, treats of the natural and chemical history of drugs; and is the department of Materia Medica which will constitute the subject of the present course of lectures.

Pharmacy will be taught by Mr. Redwood; and the third department of Pharmacology, namely, *Pharmacodynamics*, requires no teacher in this establishment—it belongs to the Medical Schools.

"I may observe, however, that I do not intend to omit entirely all reference to the medicinal properties of drugs. Pharmaceutists, who dispense and sell medicines to the public, ought to be acquainted with some of the leading medical properties of the objects of their trade. Without a knowledge of the appropriate dose of a medicine, and of some cautions respecting its use, errors of a fatal character would be constantly occurring. Thus, for example, a retailer of drugs and chemicals ought to be aware of the powerful and dangerous effects of opiates on infants. Hence, then, we must include in the present course some details respecting the

medical properties of drugs, but they must necessarily be very brief, entirely practical, and adapted for non-professional auditors.

"Poisoning also must be incidentally noticed. My auditors are dealers in poisons. From them, directly or indirectly, the public in general procure these articles, and to them they often fly for antidotes. Here, therefore, is another very appropriate subject for discussion in this room. I do not intend, however, to enter into the details of the treatment of poisoning; but principally as to the use of antidotes. The subsequent treatment can only be properly practised by professional men. My object, therefore, will be to show how a case of poisoning ought to be treated, until the assistance of a surgeon or physician can be obtained.

"The enormous commerce carried on between this country—nay, this metropolis—and the most distant parts of the globe, and our vast colonial possessions, are great advantages to the English student in Materia Medica. By means of them he is enabled to become acquainted with the drugs of almost every nation, at least to a much greater extent than can be done in any other country.

"In the knowledge of the natural history, the origin, and the properties of Drugs, English dealers ought to be unrivalled. So far as relates to the mere trade or commerce, they probably are; but, in all that concerns science, they are far behind their Continental brethren.

"Unlike the Pharmaceutists of other countries, the Chemists and Druggists of Great Britain have hitherto been content to carry on their business as a mere trade, without acquiring scientific knowledge. With means at their command of acquiring knowledge, unrivalled by any other nation, they have hitherto allowed Scientific Pharmacy to remain in a very degenerate state."

Dr. Pereira then alluded to an article by Dr. Buchner, the able editor of one of the oldest and most respectable German Pharmaceutical Magazines (quoted in our last number, p. 187), in which the late proceedings among the Chemists in this country are commented upon and commended, as being an indication of a new era, by which the English Chemists "are now in a fair way of placing themselves on a level with the Apothecaries of Germany and France, perhaps of surpassing them;" as it is remarked by Dr. Buchner, that "the English follow up with the greatest determination any object they have in view, and are not easily led astray, deterred, or confounded in their undertakings."

In briefly tracing the early history of Pharmacy, the Lecturer

observed, that "priority in the cultivation of this useful department of knowledge had been claimed for the *Greeks*, the *Egyptians*, and the *Hindocs;* but that the claim of the two latter nations was supported by the most authentic evidence.

"In the Bible, Moses, who lived about 1500 years before Christ, speaks of the Ishmaelites carrying *spices*, *balm*, and *myrrh* from Gilead to Egypt, at a period of about 230 years previously, namely, 3573 years ago.

"The most ancient prescription on record is that given by Moses for an *odoriferous ointment:*

"Take thou also unto thee principal spices, of *pure myrrh* 500 shekels, and of *sweet cinnamon* half so much even 250 shekels, and of *sweet calamus* 250 shekels, and of *cassia* 500 shekels, after the shekel of the sanctuary, and of *oil-olive* an hin. And thou shalt make it an oil of holy ointment, an ointment compounded after the art of the apothecary; it shall be an holy anointing oil."

The same chapter contains the following recipe for a *confection:*

"And the Lord said unto Moses, Take thou unto thee sweet spices, *stacte* and *onycha* and *galbanum;* these sweet spices with *pure frankincense* of each shall there be a like weight. And thou shalt make it a perfume, a confection after the art of the apothecary tempered together pure and holy."

"From these curious recipes an important inference may be drawn. The drugs were not the produce of Egypt. *Cinnamon*, *calamus*, and *frankincense* are the produce of India; *cassia* of China; *myrrh* of Arabia; *galbanum* probably of Persia. At this period, therefore, there must have existed a commercial intercourse between India and Egypt.

Among the substances anciently used in medicine, Dr. Pereira mentioned the *squill*, *natron* (or carbonate of soda), and *black hellebore*. "The latter medicine was introduced (about 3241 years ago by Melampus, a Greek shepherd, who was also described as a soothsayer and a physician, and who observed the effects of the plant on goats, which, when sick, instinctively resorted to it. Melampus was applied to by Prœtus, king of Argos, to cure his three daughters of insanity. The princesses, it is said, imagined themselves to be cows, and were running about the fields naked, and imitating the cries of cattle. Melampus asked a high price for the cure, namely, a third of the kingdom; and the king refused to accede to the terms, until the disease becoming contagious among the Argian women, he was obliged to consent. Melampus purged them by hellebore, cured them, and obtained the most handsome of the three for his wife, with one-third of the kingdom. This," said Dr. Pereira, "is probably the highest price ever paid for a purgative draught.

"I may take this opportunity of stating, that the plant which the Greek writers tell us was used by Melampus, is what they call *black*

hellebore, ελλεβορος μελας; and Dr. Sibthorp has shown, that the plant known in Greece by this name, is *Helleborus officinalis*. But the London College has fallen into an error in supposing this to be the source of the black hellebore now in use. Our *Helleborus niger* is not identical with the black hellebore of the ancients. In the Greek Pharmacopœia, published at Athens, 1837, the root of *Helleborus niger* is officinal, but the Editors state, that the *Helleborus officinalis*, the root of which was used by the ancients, is still met with on the mountains of Greece and Asia Minor, and that its virtue is equal to that of *Helleborus niger*."

Melampus is also notorious for having been the first person who administered internally a mineral medicine. He is said to have cured Iphicles, son of Philacus, of impotence, by administering the rust of iron digested in wine.

Hippocrates, who was born at Cos, 460 years B. C., has been styled the *father of medicine*, and although he was a physician, ought not to be passed over in this brief notice, as his *Materia Medica* comprised thirty-six animal substances, three hundred vegetables, and one hundred and fifty animal products.

The most distinguished writer of ancient times, on Materia Medica, was Dioscorides, who was an eminent Greek physician. He lived about 54 years B. C., cotemporary with Pliny, who is said to have copied from his writings. Dioscorides composed five books on Materia Medica, in which he described seven hundred plants, ninety minerals, and one hundred and sixty-eight animal substances. His descriptions are short, of a general nature, and frequently insufficient to characterize species. For sixteen hundred years his works were considered the first and almost only authority.

Among the commentators on Dioscorides, Dr. Pereira mentioned Matthiolus, and also Dr. Sibthorp, who visited Greece on two occasions, for the purpose of identifying the plants described in the above works. Dr. Sibthorp died before his work was finished, but bequeathed £200 a year towards the completion of his *Flora Græca*, which comprised ten folio volumes, with 1000 plates. It was completed by Dr. Lindley.

Galen, another distinguished Greek physician, was born about A. D. 131. He was a man of prodigious learning, and indefatigable industry, which he devoted chiefly to researches in Materia Medica. His hypothesis respecting the operation of medicine, in reference to *heat*, *cold*, *dryness*, and *moisture*, was unmeaning and fallacious, although it was not controverted until the time of Paracelsus.

Herophilus, Erasistratus, Scribonius Largus (the author of the first Pharmacopœia, A. D. 40), Sahel, the son of Sabor (the author of the first Dispensatory, A. D. 850), Geber, "the Patriarch of

Chemistry," and Avicenna, "the Prince of Physicians" (a celebrated author on Materia Medica), were briefly noticed. Paracelsus, who is also described by the names of *Phillipus, Areolus, Theophrastus, Paracelsus, Bombastus ab Hohenheim*, was a notorious quack, who, nevertheless, introduced a revolution in Materia Medica and the practice of medicine. He commenced his career by publicly burning the works of Galen and Avicenna. Although he may have been, as he has been described, a *vain, ignorant, arrogant, drunken quack, fanatic*, and *impostor*, he was of great service by destroying the implicit confidence in the doctrines of his predecessors, and he introduced many valuable medicines. He died at the age of forty-eight, in great poverty, although professing to possess the power of making gold and silver, of renovating age, and procrastinating death. Dr. Pereira here referred to Dr. Marx's recent learned defence of Paracelsus.

For further particulars relating to the history of Pharmacy in modern times, Dr. Pereira referred to the *Historical Sketch of the Progress of Pharmacy in Great Britain*, which forms the introduction to this Journal.

After alluding to several modes of classifying the Materia Medica, to which objections existed, Dr. Pereira concluded his lecture by a brief outline of the natural history method which he proposed to adopt, as follows:

"In nature there are two classes of forms, two classes of structures, two classes of properties.

	Forms.	*Structures.*	*Properties.*
Class 1.....	Angular.	Crystalline.	Non-vital.
" 2.....	Rounded.	Organized.	Vital.

"On this basis rests the natural history distinction of natural bodies into two classes:

Class 1. Mineral, inorganized, brute, crystalline.
" 2. Organized, living, vital.

"But organized or living bodies are themselves subdivided into animal and vegetable, although the distinction is imperfect. Hence we have as leading divisions of Materia Medica,

1. Mineral or Inorganized Materia Medica.
2. Vegetable Materia Medica } Organized Matoria Medica.
3. Animal Materia Medica ... }

"The *Mineral Materia Medica* will constitute a very small portion of the course. The discussion of this subject would be going over almost the same ground as Mr. Fownes, the chemical lecturer, will take in his course. I shall, therefore, omit such details as fall more particularly under the province of the lecturers on Chemistry and Pharmacy.

"Yet the Mineral Materia Medica must not be wholly omitted.

I propose to take a general mineralogical and geological survey of the rough minerals from which are obtained the inorganic articles of the Materia Medica, leaving the minutiæ of their ultimate chemical constitution to Mr. Fownes, and their officinal compounds and preparations to Mr. Redwood.

"I am not desirous of saying much as to the illustrations of the lectures, lest I might disappoint the expectations of my auditors. I think it proper, however, to state, that the Museum of the Society, already an excellent one, is in progress of enlargement, and that the Council have complied with my request to make such purchases as will be necessary to render this Museum most complete for lecture purposes, and at the same time no less valuable for the reference of all the Members of the Society. I confidently anticipate, that it will, ere long, be the most splendid and complete Museum in this country. To make it such, however, the Members must individually assist."

PROVINCIAL SCHOOLS OF PHARMACY.

Bath.—Mr. Tylee, the Secretary, reports that Mr. Noad's lectures on Chemistry during the past season, were attended by thirty-one students, and that the lecturer expressed much satisfaction at the attention and diligence of the class. A library has been established, and is gradually increasing. The books, among which are several chemical and pharmaceutical periodicals, are in circulation among the subscribers. Donations of chemical apparatus have been received. Monthly meetings are regularly held by the Members for scientific discussion, and other business.

Bristol.—Active arrangements are in progress for the delivery of a course of lectures on Chemistry, by Mr. Herapath. The formation of a library has commenced, and an outline of the regulations has been drawn up. Mr. Knight, the Secretary, who has been indefatigable in his exertions, promises a more detailed report next month.

Manchester.—Several courses of lectures are in contemplation, and extensive subscriptions have been entered into for the formation of a Library and Museum.

Norwich.—Arrangements have been made with Professor Mann for the delivery of courses of lectures on Materia Medica and Botany. Thirty-five tickets to the first course have already been disposed of, and the lectures will commence with as little delay as possible. Mr. Cubitt, the Secretary, gives a very encouraging report of the progress which has been made in founding a library, to which numerous donations have been received.

Grants of money have been voted by the Council to the above places in aid of the Schools.

PHARMACEUTICAL MEETING,

OCTOBER 11th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

The Chairman, in opening the meeting, observed, that it was not absolutely necessary that every paper discussed at those meetings should consist entirely of original matter. Any subject with which the Members and Associates might, probably, not be familiar, and which was calculated to interest and improve, was admissible, even if the substance of the paper had been already published. With this view he had drawn up a short paper on Ambergris. His attention had been directed to the subject in consequence of having, a short time ago, met with the *History of Japan*, written originally by Dr. Kæmpfer, physician to the Dutch Embassy, and translated into English by Dr. Scheuchzer, in two volumes, folio, date 1728. He (Mr. Payne) had been rather surprised to find therein an account of the cure of colic by means of acupuncturation and of the use of moxa (*Artemisia vulgaris latifolia*), by the natives, and also some observations on ambergris.

It occurred to him, that the latter might not be uninteresting to the Society, inasmuch as it is a substance with which many Members and Associates are not very familiar; and the remarks, though of so early a date, appear to be, in some particulars, curious, and, perhaps, useful; at all events, he thought that they might create a desire to consult more recent authorities respecting an article, which, though not used in medicine, is extensively employed by Chemists and Druggists, who meet with it in some variety as to appearance and quality.

AMBERGRIS.

It is well known that the nature and origin of ambergris were, for a very long period, quite unknown. "Authors differ," says Dr. Kæmpfer, "widely in their opinion both as to its origin and production; nor do they even agree as to what kind of substance it properly is. Some take it to be a bituminous substance, others a sort of earth or clay; some think it is a sea-sponge, others the dung of birds. Dr. Denys, in 1672, asserted, that 'ambergris is a mixture of wax and honey, gathered upon the sea-coasts by bees, which, by being digested by the heat of the sun, falls into the sea, where by the motion of the waves and ad-

mixture with saline particles it becomes changed into this precious article;' but the most generally received opinion is, that it is a kind of bitumen generated in the bowels of the earth, or a subterraneous fat grown to the consistence of a bitumen, which by subterraneous canals is carried into the sea, where, by the heat of the sun, and admixture of saline particles, it becomes ambergris."

After refuting the assertion of Dr. Denys, by several arguments not necessary to mention, Dr. K. goes on to describe its varied appearance as at that time usually met with. He tells us, that he himself saw a fine greyish specimen, weighing 180 lbs. Dutch, which had been divided into four parts; another piece found in 1693 was sold by the king of the country for 11,000 rix-dollars, about £2000 sterling, to the Dutch East India Company; it was sent to Amsterdam, where it was then kept, and it weighed 185 lbs.; it was of a grey colour, in shape not unlike a tortoise with the head and tail cut off, and was bought on condition that, if found adulterated, it was to be returned (certainly a very good precaution, but not so easily to be accomplished).

Dr. K. next speaks of the adulterations to which it is liable and gives some modes for detecting them, all of which Mr. Payne, fully detailed.

Mr. Payne then proceeded to observe, that it is usual to prefer ambergris which on fracture, presents a grayish and somewhat speckled appearance; unctuous when pressed between the fingers; smell somewhat resembling old cow-dung, tolerably soluble in rectified spirit, to which it imparts its odour, and in proportion to which solubility its quality or purity may be determined; depositing from the solution, when dried off, a whitish and fatty residuum.

Ambergris is now well known to be obtained from the intestinal canal of the cachalot, or sperm whale; so that the name of *whale's dung*, which Kæmpfer tells us the Japanese have given to it, is by no means an inappropriate one. It is usual to meet with extrinsic impurities in it, which have been mistaken for shells, but which are in fact the beaks of the Sepia moschata, on which the sperm whale feeds. This is a strong confirmation of the common opinion of the intestinal origin of ambergris.

According to some writers, it is regarded as hardened fæces merely, while others consider it to be a product of disease; Mr. Beale, in his *Natural History of the Sperm Whale* (1839) observes, that on one occasion, while in the North Pacific, he had the curiosity to collect some of the semi-fluid fæces which floated from the carcase of a whale, while the men were cutting it up; and which, on being dried in the sun, bore all the properties of ambergris. On the other hand, Mr. F. D. Bennett, in

his *Narrative of a Whaling Voyage round the Globe* (1840), declares, that "ambergris is a morbid concretion in the intestines of the cachalot, deriving its origin either from the stomach or biliary ducts, and allied in its nature to gall-stones, or to the bezoars of herbivorous animals; while the masses found floating on the sea, are those that have been voided by the whales, or liberated from the dead animal by the process of putrefaction.

"It is not common," he adds, "for the whaler to find ambergris in the cachalots he destroys; nor does he, indeed, make a very rigid scrutiny of the intestines in search of it, unless a suspicion of its presence be excited by some marked peculiarity in the whale, as a torpid and sickly appearance, and the animal failing to void liquid excrement, as is usual with healthy whales, when alarmed by the sudden approach to the boats, or struck by the harpoon. Some years ago the whale-ship "Mary," of London, discovered a dead cachalot floating on the ocean, and as there were no injuries on its body to account for death, that event was attributed to disease; consequently the whale was searched for ambergris, and the captors were gratified by finding a very large quantity of that valuable drug impacted in its bowels."

The Greek merchants are purchasers of ambergris, in some quantity, it is believed for use in their religious ceremonies; and Mr. Payne stated that he had found their judgment useful in deciding on its quality, and had occasionally met with some small pieces in their possession of considerable fragrance, and of apparently a different species to that usually met with in our markets.

Although ambergris is seldom used in this country, excepting as a perfume, it is esteemed as a valuable medicine in some eastern countries.

Mr. Payne further observed, that a very spurious article is sometimes met with—which may be readily detected on the slightest examination of its external character by any one who has seen specimens of the genuine kind.

ON HEMIDESMUS INDICUS.

BY MR. JACOB BELL.

(Syn. *Periploca indica*, WILD. *Asclepias pseudosarsa*, ROXB.)

THE root of hemidesmus indicus has for some years been sold in this country under the name of Smilax Aspera. It is imported in considerable quantities from India, where it is called *country sarsaparilla*, *nannari* or *nunnarivayr*. Dr. Ashburner, who introduced it to the notice of the profession in this country, gave

it the name of Smilax Aspera, on the authority of Ainslie; but it is evident, that a misunderstanding existed respecting the identity of the plant, as the roots are essentially different, which will appear from an examination of the specimens on the table. The smilax aspera is a tough, cylindrical root, having very little taste or smell, and covered with a thin, smooth, brown bark, which also is insipid. The root of hemidesmus indicus is also cylindrical, covered with a brown bark, and is similar in dimensions; but it is more tortuous, rugous, and is furrowed longitudinally. The bark is very thick, brittle, and aromatic; and constitutes above half the substance of the root. By bruising in a mortar, the bark crumbles off, and may easily be separated by sifting, as the wood, although not nearly so tough as that of smilax aspera, is much less brittle than the bark. The aroma, which is very strong, and similar to that of new hay, resides chiefly in the bark; but even the wood possesses enough of this peculiar character to distinguish it from that of smilax aspera.

Mr. Garden, who examined the root of hemidesmus indicus in the year 1837*, discovered in it a peculiar volatile substance, which he obtained in a crystalline form, and which he termed *smilasperic acid* (in the belief, which at that time prevailed, that the root was that of smilax aspera). Dr. Ashburner published a paper on this root in the *London and Edinburgh Physical Journal*†, in which he speaks in high terms of its efficacy in many of those cases in which sarsaparilla is recommended.

It has generally been administered in the form of a syrup, but an infusion, and a decoction have also been used, the proportions being the same as those adopted in the decoction of sarsaparilla, namely, two ounces of the root to a pint of water‡. There is no recognised formula for the syrup, unless that of the Pharmacopœia for syrup of sarsaparilla be taken as the standard, which has been proposed in consequence of the supposed similarity of the remedies. It is particularly necessary, however, in making the syrup of hemidesmus indicus, to avoid a high temperature, which would dissipate the volatile principle of the root, and on this account the following method of manipulation has been adopted with a satisfactory result:—

Take of	the root of hemidesmus indicus ...	1lb. avoirdupois.
	Refined sugar.....	1lb. "
	Distilled water, about	3 pints.

Bruise the root sufficiently to separate the bark by sifting, and reject the wood. Add to the bark an equal bulk of washed sand, moisten with water (three or four ounces) so as to ensure its

* *Lond. Med. Gazette*, vol. xx., p. 800.
† Vol. lxv., p. 189.
‡ *Dr. Pereira's Elements of Materia Medica*, p. 1289.

intimate mixture, and pack it well in a displacement apparatus. Add as much water as it will absorb, macerate for four hours, and displace the liquor by the addition of a further portion of water. Reserve the first six ounces. Add more water until it passes through tasteless. Then evaporate the latter portion to three ounces, in which, with the addition of the first six ounces, dissolve the sugar with as moderate a heat as possible. By this means, the first portion of the liquor which contains the major part of the aroma, is not subjected to the process of evaporation, and the result is twenty ounces, by measure, of a syrup possessing all the aromatic properties of the plant.

A paper

ON ECONOMICAL COMBUSTION AND EVAPORATION,

Was submitted to the Society

BY MR. HENRY DIRCKS,

Who alluded to the treatise on the *Combustion of Coal**, by Mr. C. W. Williams, in which is pointed out the source of error in many of the expedients which have been contrived for "smoke-burning."

The leading principle developed in Mr. Williams's treatise, is, that if gas in jets be supplied with air, or air in jets be supplied with gas, combustion will be perfect, and a smokeless flame produced. In close furnaces, the gaseous products of the fuel can only get air through the grate-bars, the doorway, or some accidental inlet; but in no common furnace can the supply of air adequate for the complete combustion of the gas, be obtained. Mr. Williams provides this needful supply through a perforated air-distributor, carrying the air into, and mixing it intimately with the large volume of gas; producing bright, instead of dark smoky flame, and consequently the *gas* is burnt, and *smoke* prevented. From its near approach to the principle of the Argand lamp, this plan has been designated the Argand Furnace; in the one we see jets of gas thrown into air, in the other numerous jets of air thrown into an atmosphere of gas: stop ever so partially the admission of air to either, and smoke is instantly produced; both aim at obtaining extent of surface, to secure better diffusion and more intimate union.

The crude impure coal gas evolved immediately after each fresh charge of fuel, without this supply of air thus judiciously given, would, by being only partially burnt, be wasted in the

* *The Combustion of Coal.* Illustrated with coloured Diagrams. By C. W. Williams. 8vo, 2d edit. Simpkin, 1841. pp. 184.

form of smoke, which, fouling the exterior surface of the vessel, considerably lowers its evaporating power, while, at the same time, as a necessary consequence, much of the available heat of the gaseous fuel is lost, and dependence placed only on that given off by the solid incandescent fuel.

Next to the obtaining of perfect combustion, much attention has been paid by many to means for increasing the evaporative power of boilers. This Mr. Williams effects by studding the boiler-plates with wrought-iron pins, made of three-fourths of an inch round iron, and each three or four inches long. These are screwed into the boiler from the outside, or made slightly tapering, and driven from the inside through holes drilled for the purpose, until they project within to only about one inch. This internal projection may be beaten down to a rivet-head, thus providing for the easier cleaning of the boiler when encrusted with shelly deposit of carbonate of lime. The bottom of the boiler, together with the ends and sides exposed in the flues, may in this manner be bristled over with conducting-pins, three or four inches apart, giving an increased evaporative power up to twenty-five per cent. or more. A boiler of this description is an excellent absorbent of the heat, the flame and heated air impart their caloric to the pins, and these in like manner to the water, whereby ebullition is greatly promoted.

Another rapid and exceedingly ingenious steam-generator is that invented by Mr. Andrew Smith, consisting of a cast-iron trough, in which a fusible alloy is kept, at a temperature of from 400 to 500°; imbedded in this melted metal is a wrought-iron tube of one or two inches diameter, bent to a serpentine or zigzag form, and protruding at each end of the trough. The whole of this arrangement is enclosed in a furnace, in which coal or coke may be burnt, presenting great economy of space, from not being more than one-tenth the usual dimensions. Supposing one end of the serpentine tube to be connected with the steam-pipe of an engine, the other end would have attached to it a force-pump; and as often as water is forced into the serpentine pipe, the whole is immediately converted into steam, and escapes under such pressure as is provided at the other extremity of the pipe. In this operation the force-pump may be worked constantly, or at any stated intervals, as there is not the usual danger attending the absence of water in the boiler, which is perhaps the most striking and characteristic feature in this invention. The fusible metal melting at 320°, and taking up heat sixteen times more rapidly than water, is a constant reservoir of heat, which the water forced through the bent tubing, cannot exhaust, when properly proportioned to the work required.

The foregoing remarks contain hints which it is hoped will be

found interesting and useful to all who are concerned in Pharmaceutical operations on a large scale, as pointing out means, both scientific and economical, for the production and application of heat, whether for steam power or otherwise. The object of these improvements is to obtain the combustion and heating effect of that gas which, in ordinary furnaces, is wasted—impart to boilers that heat which usually escapes—and to produce the largest quantity of steam, on a small scale of boiler and furnace, with certainty and safety.

Mr. Dircks exhibited a model of a furnace, in illustration of the mode of construction described, and demonstrated the efficacy of the conducting-pins by means of two "etnas," one of which was furnished with these pins, while the other was not. In the former, the water boiled in three minutes; in the latter, it required four.

An account of the recent case of poisoning by sulphate of potash, together with reports of similar cases which have occurred on the continent, having been prepared for publication in this journal, the Editor submitted it to the consideration of the meeting, thinking it likely to be interesting to the Members. (See page 256). Some little discussion ensued, which had reference to the usual dose of sulphate of potash, the comparative insolubility of the salt, the responsibility which attaches to the sale of substances which are powerful and uncertain in their effects, and the necessity of inquiring, when any doubt exists, whether the parties purchasing the articles understand how to use them.

Mr. Mowbray presented to the Society samples of extract of hyoscyamus prepared *in vacuo*, No. 1, having been prepared from the biennial plant, No. 2, from the annual.

ILLUSTRATIONS OF THE PRESENT STATE OF PHARMACY IN ENGLAND.

BY RICHARD PHILLIPS, F.R.S., &c., &c.
Honorary Member of the Pharmaceutical Society.

HAVING lately been absent from London, I heard that there was residing in the neighbourhood of the place which I visited, a Chemist and Druggist, of no ordinary degree of pretension, and of attainments which were not supposed to warrant the opinion that he had formed of his own superiority. To this person's shop I went, and found, by his handbill, that he was not content with being considered as a simple Chemist and Druggist, for he has, in the document just alluded to, announced himself as M.D., M.F.P.S.G. and M.R.V. INST. LOND.; the meaning of several of these letters, though I cannot with any certainty decipher, I might, perhaps, not unaptly supply without any great stretch of imagination.

To this person I presented a paper, on which was clearly written *Potassæ Hydratis*, ʒ*ij*., and he supplied me with what he labelled *Hydr. Pot.* ʒ*ij*. This brief nomenclature might have been intended to describe the article for which I had written, but as the substance actually contained in the vial was in small colourless crystals, instead of brownish or drab coloured sticks, it evidently was not that which I had ordered. On examination, I found it to be what I suspected, both from its appearance and from the facts mentioned in my last communication, namely, iodide of potassium. It was, however, of very inferior quality; being extremely moist, in ill-defined crystals, and contained iodate and carbonate of potash. This country Chemist, therefore, like some of his London brethren, was puzzled by the genitive case.

The preparation which I shall next describe, as having been purchased and examined, is *Acidum Aceticum.*

The London Pharmacopœia of 1824 contained, in the Materia Medica, what was called Acidum Aceticum fortius, the specific gravity of which was stated to be 1.046, and 100 parts of it saturated 87 grains of crystallized carbonate of soda. In the present Pharmacopœia a process is given for obtaining acetic acid of sp. gr. 1.048, and its saturating power is similar to that above given.

I purchased six samples of this acid, and examined their properties:

No 1. Specific gravity 1.048. Contained only a slight trace of sulphuric acid, sulphuretted hydrogen did not discolour it; this sample was, therefore, nearly pure, and was of the proper sp. gr. and strength, or about 31 per cent.

No. 2. Specific gravity 1.043. Contained small portions both of sulphuric and hydrochloric acids, sulphuretted hydrogen did not discolour it; the sample, therefore, judging from its density, was about two per cent. too weak.

No. 3. Specific gravity 1.048. Contained no sulphuric acid, and was not discoloured by sulphuretted hydrogen. This sample was, therefore, in every respect good.

No. 4. Specific gravity 1.035. It was therefore too weak by about nine per cent.; and as it contained a large quantity of sulphuric acid and a considerable quantity of hydrochloric acid, it was still weaker than denoted by its deficient density. Sulphuretted hydrogen showed, however, that it was free from metallic impregnation.

No. 5. Specific gravity 1.008. The Chemist, from whom I procured this, inquired whether I wanted *strong* acetic acid? to which I replied, that I required the acetic acid of the London Pharmacopœia. Adverting, I presume, to the Pharmacopœia of 1824, instead of the present, he intended, I suppose, to give me, what was therein called Acidum Aceticum dilutum, properly distilled vinegar. To prepare this, he diluted the stronger acid with water; and it will be observed, that what I obtained was very nearly of the density of distilled vinegar. It contained a very large quantity of sulphuric and considerable hydrochloric acid; sulphuretted hydrogen did not discolour it.

No. 6. Specific gravity 1.006. I asked for Acetum Destillatum, and this was given to me as such. The density is nearly or quite correct. It had not, however, the peculiar odour of distilled vinegar, and was evidently diluted acetic acid. It contained both sulphuric and hydrochloric acid; but sulphuretted hydrogen denoted the absence of metallic impregnation.

Æther Sulphuricus.—In my last communication I gave the specific gravity of four specimens of sulphuric ether; the density, according to the Pharmacopœia, ought to be 0.750. I found the sp. gr. of the four samples in question to be 0.746, 0.760, 0.832, and 0.869, and I observed that only one of these was as light as directed.

I have since examined six additional samples, and though no one was so bad as the worst abovementioned, there was only one that was nearly as good as directed. Their densities and properties were as follows:—

No. 1. Colourless. Not acid to litmus paper. Specific gravity 0.751. This consequently may be considered as a good specimen.

No. 2. Colourless. Not acid to litmus paper. Specific gravity 0.761.

No. 3. Colourless. Accidentally not tried with litmus paper. Specific gravity 0.772.

No. 4. Colourless. Not acid to litmus paper. Specific gravity 0.792.

No. 5. Colourless. Not tried with litmus paper. Specific gravity 0.817.

No. 6. Colourless: Not acid to litmus paper. Specific gravity 0.826.

It is evident, on mere inspection, that five of these specimens must have contained variable quantities of spirit or water.

Sodæ Carbonas exsiccata.—In the present Pharmacopœia crystallized carbonate of soda is directed to be first dried, and then subjected to a red heat to render it anhydrous; the last part of the operation was directed in order to insure uniformity in the product. I applied to four Chemists for this preparation, and not one of them had it; one, indeed, informed me that I should have some difficulty in obtaining it, because it was so little used.

I procured, however, six specimens, which I submitted to a red heat, and the following are the quantities of anhydrous carbonate and water, of which 100 parts consisted, instead of being entirely anhydrous carbonate:

No. 1.	Anhydrous carbonate,	83.	Water,	17.
No. 2.	"	"	76.	"	24.
No. 3.	"	"	70.	"	30.
No. 4.	"	"	57.	"	43.
No. 5.	"	"	48.	"	52.
No. 6.	"	"	64.	"	36.

It is therefore evident, not only that no one of the foregoing samples had been submitted to the proper degree of heat, but that two of the products varied to the amount of 35 per cent. Having purchased No. 6, in a packet ready put up for sale, and labelled Carbonate of Soda, I suspected it to be the sesquicarbonate of the Pharmacopœia, and such it appeared to be, for a portion of it dissolved in water, and added to a solution of sulphate of magnesia, occasioned no precipitation therein.

Potassæ Tartras.—This, like the last preparation examined, though not one of the highest importance, I thought worth examining, because I have generally observed that it is very imperfectly prepared, and sold in the state of powder, instead of that of crystals as directed in the Pharmacopœia; the only apology which I conceive can be offered for omitting the crystallization, is the trouble, slight as it is, of conducting the operation.

The impurities to be suspected are, excess of carbonate of potash, and the sulphates and chlorides which this salt has been shown very frequently to contain.

Potassæ Tartras, No. 1.—Pulverulent, solution slightly

alkaline to test-paper, but did not contain sufficient carbonate of potash to effervesce on the addition of an acid—contained a considerable quantity of chloride of potassium, and a little sulphate of potash.

No. 2. Pulverulent. Solution alkaline to test-paper; but did not effervesce with an acid. Contained a trace of chloride of potassium and of sulphate of potash.

No. 3. Pulverulent. Solution slightly alkaline to test-paper; did not effervesce on the addition of an acid. Very considerable quantity of chloride of potassium, and but little sulphate of potash.

No. 4. Pulverulent. Solution alkaline to test-paper; no effervescence on the addition of an acid. Chloride of potassium considerable, slight trace of sulphate of potash.

No. 5. Pulverulent. Alkaline to test-paper; no effervescence with an acid. Considerable chloride of potassium, trace of sulphate of potash.

No. 6. Pulverulent. Solution very alkaline to test-paper. Effervesced very considerably on the addition of an acid, and therefore contained great excess of carbonate of potash. Traces of chloride of potassium, and considerable sulphate of potash.

I have now concluded the "Illustrations of the State of Pharmacy," at least for the present; and I trust that I have amply proved, that its condition is such as ought to excite every branch of the medical profession to endeavour to procure its improvement.

It cannot fail to be observed, that agreement with the directions of the Pharmacopœia forms the exception, and that a scanty one; while a violation of them seems to constitute the rule.

I submit the evidence which I have collected to the consideration of the Pharmaceutical Society, hoping, that among its own members at least, it will effect the reformation which the public safety so urgently demands.

I have stated that I discontinue the Illustrations for the present; and I do so with the intention of resuming them when sufficient time may be supposed to have elapsed for remedying the existing delinquency, whether arising from carelessness, ignorance, or fraud.

REMARKS ON THE ILLUSTRATIONS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—It is impossible to read Mr. Phillips's analyses of the chemical substances, which he has submitted to examination, without regretting that such statements of ignorance and adulteration, however correct, should be handed down to posterity

through the medium of our own journal; I trust, indeed, that these evils need only to be pointed out that they may be remedied, and that to those of our members who have not higher motives in strictly adhering to the directions of the College of Physicians, the salutary influence of the *possibility* of some preparation being sent for examination, by the *critical analyzer*, may occasion greater care, and lead to more observation and research than has hitherto been practised.

But although it is true that such discrepancies exist in the year 1843 among Chemists and Druggists, it should not be forgotten that we are but just merging from a nondescript kind of existence, and that the benefits of the Pharmaceutical Society are but just beginning to produce that improvement which our union is likely so greatly to increase, and that many of our members have not had the opportunity of acquiring that information which the rising generation possess in the talented Lecturers of the Society.

In attempting to place British Pharmaceutists of the present day in a fair position, compared with the advance of Chemical and Pharmaceutical knowledge, reference should be also made to the practice of the profession, which is best exhibited in the prescription-book of the former.

* * * * * *

[Our Correspondent proceeds to point out the unscientific compounds which are sometimes ordered, and subjoins, by way of illustration, a series of prescriptions, containing substances which decompose each other. These criticisms being rather out of our province, especially coming from an anonymous Correspondent, we think it right to omit that part of the letter.—Ed.]

I remain, Sir, yours respectfully,

G. N.

FURTHER OBSERVATIONS ON THE FLUID EXTRACT OF SENNA.

BY PROFESSOR CHRISTISON.

[The following is an extract of a letter, which we have received from Professor Christison, and which arrived too late for publication in our last number:]

"I should wish it to be more distinctly understood, that the process for the fluid extract of senna was devised by Mr. Duncan, and communicated by him to me with permission to make it known. It is right also for me to add, that a similar preparation was introduced here about the same time, by Messrs. Smith in Duke Street. I am not acquainted with their process, which, so far as I am aware, has not been made public; but their fluid

extract differs from that of Mr. Duncan in being seasoned with aromatics. I doubt whether this is a useful addition. Certainly it is not necessary; for the simpler preparation has appeared to me entirely free from all tendency to occasion griping.

"Mr. Duncan has found that cold water answers equally well for exhausting the senna with boiling water, when it is used according to the method of displacement. If Alexandrian senna be used, instead of Tinnivelly senna, I apprehend it will be necessary to pick it carefully clear of all fragments of the leaves of *Cynanchum Arghuel*, for these communicate a bitter taste, and are probably the cause, in part, of the griping caused by the ordinary preparations. At all events, I have satisfied myself, by experiment, that they occasion severe griping when given alone.

"The fluid extract of senna is now used very largely in this city, and by many medical practitioners, as well as myself, almost to the exclusion of every other preparation. I have no doubt that it is the best form in every respect which has yet been proposed."

Edinburgh, Oct. 12, 1843.

ANALYSIS OF THE ASHES OF THE BARK OF THE BEECH TREE, AND OF THE LEAVES OF THE POTATO PLANT.

BY MR. WILLIAM BASTICK.

The following analyses, performed in the Giessen Laboratory, may be interesting from peculiarities in the constitution of the substances. The first, the ashes of the bark of the beech-tree, contains an unusually large quantity of the oxide of manganese; and the second, the ashes of the leaves of the potato-plant, contains a soluble salt of magnesia, which, I regret, I was unable to determine quantitively, from the small quantity of the ashes which I obtained.

No. 1.	
Carbonate of Potash	17.347
Sulphate of Potash	2.830
Chloride of Potassium	.682
Carbonate of Lime	22.117
Carbonate of Magnesia	4.336
Peroxide of Iron	3.125
Oxide of Manganese	3.782
Phosphates of Lime and Magnesia	36.588
Silica	9.193
	100.

No. 2.

Chloride of Sodium
Chloride of Potassium
Chloride of Magnesium.
Sulphate of Magnesia
Sulphate of Soda
Sulphate of Potash
Peroxide of Iron
Carbonate of Lime
Carbonate of Magnesia
Phosphate of Magnesia
Phosphate of Lime
Phosphate of Iron
Phosphate of Alumina
Silica

OBSERVATIONS ON SYRUP OF SARSAPARILLA.

BY THOMAS J. HUSBAND.

(Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, March 6, 1843).

Few medicines of such undoubted remedial powers as are now justly conceded to belong to sarsaparilla, have undergone so many changes in reputation. Perhaps, at no period has it been more highly esteemed in this country than at the present time. The improved formulæ for its different preparations in the United States Pharmacopœia of 1830, which have been observed generally by the Pharmaceutists of this city, for the past ten or twelve years, has no doubt been the means of elevating its character in the view of the medical profession, as one of our most valuable remedies in a variety of diseases. A fear that through the same channel of authority its good character is about to be, in some measure, destroyed, has induced me to perform a series of experiments, for the purpose of testing the value of the new process for extracting its active properties, which has been proposed in the late edition of the Pharmacopœia, and adopted by some Apothecaries —that of displacement with cold water. Having lately had occasion to prepare some syrup of sarsaparilla, I pursued carefully this plan; and although it yielded a syrup highly coloured, and beautiful in appearance, it certainly possessed less of the peculiar acrimonious taste that characterizes all efficient preparations of this root, than is usually observed in the syrup prepared with diluted alcohol.

No. 1. Four ounces of sarsaparilla, well bruised and macerated for twenty-four hours, was carefully treated with water by the displacement process, until the last portions of it acquired but little colour. The infusion thus obtained, amounting to two pints, was of dark colour; and when concentrated, by evaporation with a moderate heat, to four fluid ounces, formed a fluid extract strongly impregnated with the peculiar taste of sarsaparilla. Eight ounces of diluted alcohol were then added to the remaining root, and macerated for twelve hours, when one pint of tincture was passed, or displaced, by further additions of diluted alcohol. This tincture was without much colour, but possessed, in a marked degree, the peculiar taste of sarsaparilla. When evaporated to four fluid ounces, it yielded a fluid extract, richly endowed with the active principles of the root.

No. 2. Four ounces of sarsaparilla, thoroughly bruised, and digested in two pints of water, at a temperature of about 180°, for two hours, was treated by displacement with sufficient hot water to yield four pints of infusion; the funnel being so arranged as to preserve the temperature of 180° during the percolation of the liquid. It was then evaporated to twenty-two fluid ounces, and set aside for twelve hours.

A flocculent precipitate subsided, which was collected on a filter, treated with boiling alcohol and animal charcoal, for a few minutes, and passed through a filter while hot. It was then concentrated by evaporation, and set aside. When cold, the alcohol was rendered opaque, with a white flocculent precipitate. The evaporation being continued nearly to dryness, by a water-bath, the residuum was treated with boiling water, and filtered while hot. This presented a milky aspect, and had a very bitter, nauseous, and acrid taste. No deposit occurring by allowing it to become cold, it was concentrated by evaporation, and set aside for several hours, when there appeared on the surface of the liquid an oily substance, having a nauseous acrid taste, with a strong odour of the root; a substance also subsided, having the sensible properties ascribed to sarsaparillin, or the active principle of sarsaparilla. The infusion of twenty-two fluid ounces was subsequently evaporated to eleven fluid ounces (the proper degree of concentration for

adding sugar to form the syrup), and set aside for several hours, when there subsided a further precipitate, similar in every respect to that collected from the twenty-two fluid ounces. This infusion, on being reduced to four fluid ounces, formed an extract stronger in appearance than the aqueous one of experiment first. Sufficient alcohol to cover the root, remaining after treatment with water in experiment second, being poured on, and macerated for twelve hours, was subjected to displacement with diluted alcohol until one pint of tincture passed. This was evaporated to four fluid ounces; thus yielding a fluid very sensibly marked with the bitterness and acrimony of the root.

No. 3. Four ounces of bruised sarsaparilla, macerated for twenty-four hours in diluted alcohol, and treated, by displacement, with sufficient of the same menstruum, until twenty-two fluid ounces of tincture passed, was evaporated to eleven fluid ounces, and set aside for twelve hours. Further additions of diluted alcohol were made to the root, and subsequently water; but neither liquid had much taste of sarsaparilla, the strength having been exhausted by the first process.

At the expiration of twelve hours, no deposit having occurred in the evaporated tincture, it was further reduced to four fluid ounces, and yielded a fluid extract very much stronger to the taste than either of those previously obtained. This extract was boiled for several hours, frequent additions of water being made to supply the waste. The preparation was evidently much weakened by the treatment; and the peculiar aroma that arose from the liquid at the commencement of the boiling, was entirely dissipated. The similarity of odour between this and the oily substance spoken of in experiment second, would seem to identify them; and that part, at least, of the activity of the root is contained in this substance, may be inferred from its sensible properties being characteristic of the taste of good sarsaparilla. The opinion may be hazarded, that this peculiar substance represents the acrid property of the root, and is distinct from the bitterness that is believed to reside exclusively in the bitter principle of the root, or sarsaparillin.

From the foregoing experiments, I am induced to believe, that water, either cold or hot, is incompetent to exhaust the root of its acrid property, unless it is used in very large proportion. For by experiment 1, we see that the quantity directed by the Pharmacopœia for making cold infusion for syrup, is quite insufficient; and by experiment 2, that even after the use of three times as much water as directed by the Pharmacopœia, at a temperature of 180° a perceptible strength remained in the root.

From experiment 2 it appears that, by the application of heat, even below the boiling-point, some change takes place between the constituents of the root, so as to render insoluble in cold water or alcohol, principles that, doubtless, form its active properties. It is desirable, therefore, that in those preparations of this root which are concentrated by evaporation, such a menstruum should be selected as would require the smallest quantity, and which would most rapidly evaporate at a moderate temperature.

In comparison with water, diluted alcohol is, on these accounts, decidedly preferable. By this, also, the extraction of the strength of the root being more perfect, and no insoluble precipitate occurring by the requisite evaporation to lessen its activity, we have a concentrated solution of the active principles of the root, for forming either syrup or extract. Diluted alcohol is therefore free from all objection, except the expense; and this should form no consideration when the strength of the preparation is injuriously affected by its disuse. This expense may, however, be in great measure avoided by distilling off the alcohol, which will then answer for further use.

Of all the writers and experimenters on the proper treatment of sarsaparilla, no one, perhaps, is more entitled to respectful consideration, in a practical point of view, than Dr. Hancock, of the London Medico-Botanical

Society. His residence in the country producing the genuine sarsaparilla, gave him many opportunities of studying its character, and after much apparent attention to the subject, he arrives at the conclusion, that it is essential to employ a vinous liquor to extract the strength of the root. The established custom of the country, as regards the preparations of sarsaparilla, is to use a vinous or fermented one. From the testimony of Dr. Hancock, the powerfully curative influence of the Spanish "Jarave," or fermented infusion, would seem to establish the efficacy of the solvent; though, perhaps, such a mode of preparation would ill accord with the more refined processes of the pharmaceutic art of our day and time.

REPORT OF THE COMMITTEE,

To whom was referred the paper of Thomas J. Husband,

ON SYRUP OF SARSAPARILLA.

The subject treated of in the paper may be resolved into a solution of the following query, viz., What is the most efficient menstruum for extracting the activity of sarsaparilla? The author, after a series of well-conducted experiments, arrives at the following conclusions:

1st. That diluted alcohol is fully adequate to the removal of all the activity from sarsaparilla.

2d. That cold water is inadequate to wholly extract the virtues of that root, because, after its action, much acrimony remains, which can then be removed by diluted alcohol.

3d. That warm water (180° Fahr.), when applied in large quantity, did not remove all the acrimony from the root.

And, *lastly*, These premises being correct, the obvious impropriety of the *second formula* of the United States Pharmacopœia, which directs the employment of cold water, by displacement, as a means of making the syrup.

Before giving a detail of the results of their experiments, the Committee beg leave to make a few statements, drawn from prominent French authority, which have a direct bearing on the subject, and which will assist in its consideration.

Soubeiran states, that sarsaparilla contains, according to the best analyses, volatile oil, salseparine, bitter acrid resin, oily matter, extractive matter, starch, and albumen.

Salseparine is colourless, inodorous, crystallizes in radiated groups, and is a neutral substance. When dry, it has only a slight taste, but its solution is acrid, and rather bitter. It is a little soluble in cold water, more soluble in hot water, and its solution possesses, in a high degree, the property of frothing by agitation, like soapy water. It is dissolved readily by cold alcohol, but to a greater extent when it is hot, the excess of salseparine separating by cooling.

Infusion of sarsaparilla, which is odorous and sapid, loses its odour and taste when boiled for a short time, which speaks little in favour of the decoction (see *Traité de Pharm.*, tome ii., p. 62). Further, when sarsaparilla is treated with water, it is easily deprived of its extractive matter; and if we may judge from the colouration of the liquid, it is soon exhausted. But after the root has ceased to colour the menstruum, the fluid which passes possesses the power of frothing by agitation, which is due to the salseparine it contains; the latter substance having been but partially removed from the root by the first treatment. From this circumstance, it is necessary to employ very considerable quantities of fluid; and hence the method of displacement does not present any advantages in the aqueous treatment of sarsaparilla.

Both Soubeiran and Guibourt give the preference to a syrup made with the hydro-alcoholic extract, dissolved in water. Although a solution of that extract in water deposits salseparine by standing, yet, when made into a

syrup, Guibourt remarks, that it takes a long time for even a small deposition to take place.

We will now detail our experiments, and it will be seen that they corroborate the statements above, as well as those of the paper referred for our consideration.

Six ounces of sarsaparilla was obtained in coarse powder, by sifting from the ground root, composed principally of the cortical portion. One half of this was macerated in eight fluid ounces of water, for three days, and then subjected to displacement, until one pint of fluid was obtained. This infusion, which possessed the peculiar odour of sarsaparilla in a marked degree, was placed in a capsule, and suffered to evaporate, at a temperature varying from 120° to 150° Fahr., to the consistence of an extract, which we shall call No. 1.

The sarsaparilla, when removed from the apparatus, and dried, was found to still possess some acrimony, when chewed, and was treated with diluted alcohol, until eight fluid ounces of tincture were obtained; the latter yielding, by evaporation, a small quantity of dry resinous extract, No. 2.

The remaining three ounces of ground sarsaparilla were macerated in eight fluid ounces of diluted alcohol, for four days, and subjected to displacement until one pint of tincture was obtained. This was perfectly transparent; but when evaporated to six fluid ounces, a few grains of dark insoluble matter precipitated, which was separated by a filter, and the clear fluid evaporated to an extract, No. 3. The root which remained possessed no acrimony.

These different products were then carefully examined, with a view to their embodying the sensible properties of the sarsaparilla; and the Committee, with others not of their number, agreed in the correctness of the following statements:

No. 1. This extract was translucent in thin layers; dark coloured, and very soluble in water. It possessed the odour, bitterness, and acrimony of sarsaparilla in a considerable degree, and, doubtless, consisted of the extractive, with more or less salseparine and volatile oil. This extract was more efficient than most of that in the shops.

No. 3. The extract, prepared with diluted alcohol, also had the odour of the root, but its taste was more bitter and acrid than No. 1, due to its containing all the acrid resin and salseparine of the quantity of root employed. It dissolved almost completely in water.

No. 2. This extract possessed the peculiar acrimony of sarsaparilla more decided than either of the others; it being composed principally of acrid resin and salseparine, with some extractive.

One-tenth of a grain of the extract No. 2, when agitated with half an ounce of water, was sufficient, by long agitation, to convert all the fluid into froth. No. 3 possessed this character less than No. 2, and more than No. 1. This affords a means of judging approximately as to the relative amount of salseparine contained in the three extracts.

The insoluble matter which precipitated during the evaporation of the tincture of sarsaparilla, had but a very slight taste of that root, and hence the preparation is not weakened by its separation.

In making compound syrup of sarsaparilla with diluted alcohol in the usual way, the resinous matter taken up by the menstruum from the guaiacum is nearly all precipitated, and if not separated subsequently, gives the syrup an opaque appearance.

The Committee believe, that if the sarsaparilla were treated separately with diluted alcohol, and the residue with water, and the resulting tincture and infusion evaporated to the proper quantity, a more beautiful preparation would result, equally efficient.

In reference to the second formula in the United States Pharmacopœia, the Committee would observe, that it is the same as that recommended by the committee of revision of the Philadelphia College of Pharmacy. That

Committee, when engaged on the subject, concluded, from the results of experiments submitted to them at the time, that water was adequate to the extraction of the activity of sarsaparilla, and that all those portions soluble in an alcoholic, and insoluble in a water menstruum, would be precipitated when the alcohol was removed. The remark applies to the guaiacum, but to the sarsaparilla only after standing for several days; for although pure salseparine is but little soluble in water, yet the results of our experiments sufficiently prove, that when its solution is effected by treating the root with a mixed menstruum, the alcohol may be removed by evaporation, without the salseparine immediately separating, and the subsequent mixing of this solution with sugar, according to Guibourt, prevents it nearly altogether. This is probably owing to its association with substances which retard its crystallization; and the Committee believe, that owing to the same causes, cold water extracts and holds in solution more salseparine than if the same amount of that principle, in an isolated state, was submitted to its action. M. Beral, in a paper published several years since, in the *Journal de Chimie Médicale*, strongly advocates the use of cold water, as where heat is employed, the activity of the preparations suffer. (See *American Journal of Pharmacy*, vol. xii., p. 245).

In conclusion, the Committee will observe, that the syrup, carefully made with cold water as a menstruum, possesses, in a very considerable degree, the virtues of its ingredients; but they are convinced that diluted alcohol, employed as directed in the first formula of the United States Pharmacopœia, is the more eligible medium for its preparation; and in this they fully accord with the views contained in the paper referred for their consideration.

WILLIAM PROCKTER, Jr.
A. DUHAMEL,
AMBROSE SMITH.
} *Committee.*

April 3, 1843.—*American Journal of Pharmacy.*

SHORT EXTRACT FROM THE STATISTICAL REPORT OF THE PHARMACEUTICAL ESTABLISHMENTS IN RUSSIA,

IN RELATION TO THE POPULATION OF THE COUNTRY.

THERE is no country in which the number of Pharmaceutists is so small, in reference to its population, as Russia. Astrachan, a town with 46,000 inhabitants, has but one Pharmaceutist's shop. Several provinces and 382 towns in that empire are entirely deficient in establishments where medicines are prepared. In various large and densely populated provinces, as Archangel, Astrachan, Tobolsk, and Wjöka, there exists but one Pharmaceutist's shop in each province, whilst St. Petersburg, on the other hand, a town with 470,202 inhabitants counts forty-seven pharmaceutical establishments. Provinces of one million of inhabitants and upwards average about twenty establishments, whilst many departments cannot boast of one shop, as Irkutsk, and Jenisseisk, the number of inhabitants being respectively 593,321 and 191,167. Indeed, when 669 shops form the total number of shops in that immense empire, we may presume that the country must offer a good field for young Pharmaceutists* to establish themselves. In running through the list, with the number of shops in each town, we find that one establishment supplies about 10,000 inhabitants. Petersburg we have mentioned as an exception. Moscow has 349,068 inhabitants and twenty-five shops. Riga has fourteen shops and 39,936

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* [It may be as well to observe, that a knowledge of the German and French languages is essential to those who practice Pharmacy in Russia.—ED. PHARM. JOUR.]

inhabitants. Wilna has ten establishments, and 51,499 inhabitants. Odessa has ten also to 60,055 inhabitants. These are the towns best supplied with Pharmaceutists. Jekaterinburg, a town of 16,669, has no shop, nor has Ackermann, a town with 25,339 inhabitants. Tiflis has one shop and 23,045 inhabitants. Ismail has one to 21,908 inhabitants; and thus we could mention many more where the numbers are as disproportionate to the population.—*From Gauger's Repertorium für Pharmacie.* Heft. 1, pp. 3—40.

ANALYSIS OF TWO VARIETIES OF DUTCH WHITE LEAD,

Manufactured by Sprenger and Ebele, of Offenbach, and Kremser-white, from the Factory at Klagenfurt.

Link found no traces of acetic acid in either specimen (as basic acetate of lead), the acid being merely detected in the water in which the substance was washed, but not after distillation of the white lead with sulphuric acid. Neither variety contained any foreign metal, nor parted with its water at 150° C. For determining the quantity of water and carbonic acid, both specimens were heated in an apparatus for elementary analysis, and gave the following results:

	Offenbacher White Lead.			*Kremser White.*			
Carbonic Acid	11.28 ...	11.28 ...	11.28	11.31 ...	11.26 ...	11.30	2=11.28
Water	2.12 ...	1.70 ...	2.21	2.24 ...	2.21 ...	2.26	1= 2.15
Oxide of Lead	—	—	—	—	—	—	3=86.57

Both varieties correspond, therefore, with Mulder's simple formula:

$$2\,(PbO, CO_2) + PbO, HO.$$

—*Annalen der Chemie und Pharmacie.* xlvi., p. 232—235.

NOTICES OF BOOKS.

Chemistry in its Application to Agriculture and Physiology. By Justus Liebig, M.D., &c. &c. &c. Edited by Lyon Playfair, Ph. D., &c. Third Edition, *revised and enlarged.*

Familiar Letters on Chemistry, *and its Relation to Commerce, Physiology, and Agriculture.* (By the same Author). Edited by John Gardner, M.D. Post 8vo, pp. 179. *Taylor and Walton.*

Elementary Instruction in Chemical Analysis. By Dr. C. Remigius Fresenius, Chemical Assistant in the Laboratory of the University of Giessen. *With a Preface by* Professor Liebig. Edited by Lloyd Bullock, Member of the Chemical Society, late of the Giessen and Paris Laboratories. 8vo, pp. 284. *John Churchill, Princes Street, Soho.*

A Series of Tables *of the Elementary and Compound Bodies, systematically arranged and adapted as Tables of Equivalents or as* Chemical Labels. By Charles Button and Warren de la Rue. *De la Rue and Co.*, 110, *Bunhill Row, London.*

[We are obliged to defer the Reviews of the above Works until next month.]

Posthumous Extracts from the Veterinary Records *of the late* John Field. Edited by his Brother, William Field. 8vo, pp. 236. *Longman, Brown, Green, and Longmans.*

This work not being exactly in our line, we have only to observe, that those who are interested in the Veterinary art may learn much from its perusal. This kind of information may also be useful to Chemists, as it points out the responsibility incurred by giving advice without possessing the needful qualification.

Lectures on Polarized Light, *delivered before the Pharmaceutical Society of Great Britain, and in the Medical School of the London Hospital. Illustrated by above fifty Woodcuts.* (*By* Dr. Pereira, F.R.S., &c. &c.) 8vo. pp. 110. *Longman and Co.*

These lectures are interesting to the Pharmaceutical Chemist, because they suggest an application of one of the highest branches of mathematical science to the examination of some of the most familiar substances in the Materia Medica. They also contain valuable information on the subject of crystallography, with which every Chemist ought to be acquainted. In reply to the remark which we have occasionally heard expressed, that such subjects are too abstruse for the majority of our readers, we need only observe, that those who are at all conversant with the science, cannot fail to appreciate the clear and lucid manner in which an abstruse subject is treated in these lectures, and those whose attainments are more limited, ought to be stimulated by the discovery that they have something to learn.

DEATH OCCASIONED BY SULPHATE OF POTASH.

On Saturday, September the 30th, an inquest was held by Mr. Baker, at the "Duke of Sussex," Manor Place, Haggerstone, on the body of Mary Haynes, aged twenty-five, whose husband was at that time in custody on suspicion of murder.

It appeared from the evidence, that William Haynes (an oilman, residing at No. 3, Martha Street) had occasioned the death of his wife, by administering to her large and repeated doses of sulphate of potash. Both Haynes and his wife were desirous of preventing an increase in their family, and these means were therefore adopted, by mutual consent, for the purpose of procuring abortion.

The husband admitted to the Surgeon, who was called in, that he had purchased four ounces of the salt; half of which had been given in small doses without much effect, on which account he had given the remaining two ounces at once. He had also

bought two ounces subsequently, which was administered in one dose, and the death of the patient was the result. In consequence of this admission, Haynes was placed in custody.

No medical man saw the patient until after her death; but she was reported to have been affected with violent vomiting, followed by great exhaustion. When the Surgeon arrived, she had been dead half an hour; and he stated in evidence, that on examination of the brain, he found all the vessels overcharged with blood, about two ounces of which had escaped from a ruptured vessel. "There was also an extravasation of blood about the neck and cuticle, arising from convulsions caused by the sickness." He stated, that sulphate of potash was a poison, when given in large quantities; that its effect was *sedative* (!), and that it consisted of "equal portions of *sulphur and potash!*" He attributed the death of the patient to the state of the brain and the stomach, which latter organ was much inflamed.

Mr. Coward (Surgeon to the Police) attributed the death to apoplexy, occasioned not directly by the drug, but by the vomiting which followed its administration. He did not consider sulphate of potash a poison; but had no doubt of its having been the remote cause of death.

At an adjourned inquest, Mr. Thomas Sadler, Chemist, of Norton Folgate, at whose shop the sulphate of potash had been purchased, stated, in evidence, that the salt is not considered by the faculty to be a poison; that it is a mild cathartic in small quantities, but highly drastic when administered in very large doses. He had heard of patients taking as much as five drachms, but had never compounded so large a dose himself. He was of opinion that, in the present instance, the quantity taken being much more than could be dissolved in a tumbler of water, a large proportion of it must have been taken into the stomach in an undissolved state, in which case it would be much more deleterious, and a stomach already weakened by previous doses would be very liable to be injured by it.

The jury brought in a verdict of "Wilful Murder against William Haynes," and the Coroner immediately issued his warrant against him.

This case, and the circumstances connected with it, have occasioned considerable excitement. The oversight of the first medical witness, in reference to the composition and properties of sulphate of potash, has been sufficiently commented upon in the public papers. A letter from Mr. Coward, the second medical witness, was published in *The Times*, in which he exonerates himself from a participation in this erroneous statement, observing that the evidence which he gave was to the effect, that "sulphate of potash is not a poison; that it is not a compound

of sulphur and potash, but of sulphuric acid and potash; and that it is aperient, and not sedative in its effects."

This is in accordance with the prevailing opinion in the profession; but several cases, of comparatively recent occurrence on the continent, in which death has resulted from large doses of sulphate of potash, have led some practitioners to doubt whether it ought not to be classed among the poisons.

The following is a report on one of these cases, by MM. Chevallier and Bayard, published in the *Annales d'Hygiène et de Med. Leg.* for April, 1842:

"A FEMALE, who had been recently confined, died in less than two hours after taking a purgative. Legal proceedings were immediately commenced against the Pharmacien who had furnished the medicine, and who was supposed to have made some mistake; and Messrs. Bayard and Chevallier were appointed to investigate the facts of the case.

"M. Bayard, on opening the stomach, found signs of an intestinal affection. It appeared that the deceased, a week after her confinement, had taken seven *grammes* (108 grains) of a purgative salt, which ought to have been sulphate of potash; that she was immediately attacked with violent pains in the stomach and limbs, and with vomiting; that these symptoms increased in intensity with each of the succeeding five doses of the salt that were taken; and that the patient died soon afterwards.

"M. Chevallier subsequently performed a series of experiments: First, on the matters contained in the digestive canal of the deceased; he was unable to find a trace of any poisonous substance—the salt found was pure sulphate of potash. Secondly, on different salts which had been seized at the house of the Pharmacien, but none of these were of a poisonous nature.

"Messrs. Bayard and Chevallier have no hesitation in stating, that there was no mistake on the part of the Pharmacien who prepared the medicine, that the result must be attributed to the action of the sulphate of potash, and that the peculiar condition of the patient no doubt contributed to the effect so unexpectedly produced.

"The Chamber of Council determined, on this report, that there was no ground for proceeding against the prisoner."

M. Chevallier subsequently published some additional remarks on this case, in the *Journal de Chimie Médicale*, as follows:

"Sulphate of potash, which is frequently given to women during their confinement, in doses of one, two, or four drachms, ought not to be sold by the Pharmaciens without some precaution, unless ordered by a Physician, as it appears to act, in some cases, as a poison.

"Our attention has been directed to this salt, in consequence

of the proceedings which have recently been instituted against a Pharmacien who, in compliance with the directions of a Physician's prescription, administered two drachms of sulphate of potash to a female soon after her confinement—the effects being such as to induce the belief that the patient had taken poison.

"The following accounts, relative to the action of this salt, have already been published:

"1st. By Messrs. Merat and Delens, in the *Dictionnaire Universel de Matière Médicale*, p. 485. The authors express themselves as follows: "We saw in 1821, thirty grammes (463 grains) of this salt, taken, in error, instead of Seidlitz powder, produce effects similar to poisoning—sense of burning and pain in the stomach, vomiting," &c.

"2d. By J. G. Greisel, *Univ. Acad. Nat. Cur.* 1672, p. 77. He states, that two grammes (thirty grains) of sulphate of potash caused violent purging and death; but remarks, that these effects may be attributed to the previous condition of the patient, which rendered the remedy inappropriate, rather than to the activity of the salt.

"3d. By Gardieu, *Dict. des Sciences Méd.*, vol. vii., p. 165, who says, that small doses of this salt irritate the stomach and intestines of delicate females.

"4th. By Sobaux, a Surgeon of Conflans-Sainte-Honorine; who, from the effects he had observed in four cases, endeavoured to prove that sulphate of potash was a dangerous remedy."

Dr. Bonnassies has reported the following case in the *Gazette des Hôpitaux*, for December, 1843:

"A female who had got well over her confinement, and was in the enjoyment of good health, wishing to get rid of the milk which inconvenienced her, took six hundred grains of sulphate of potash, in three doses. The first dose was rejected by the stomach; the second dose brought on sickness, vomiting, purging, and cramps; on taking the third dose, all the symptoms of cholera were manifested, and the patient died.

"On examining the stomach, sulphate of potash in the solid state was found there, and some appearance of inflammation. Fragments of the salt were also found on the surface of the intestines."

If sulphate of potash is to be ranked among the poisons, the same argument may apply probably to bitartrate of potash, sulphate of magnesia, nitrate of potash, and other salts, which, although not considered to be poisons, may produce fatal consequences, if administered in excess. Mr. Tyson relates a case in the *Medical Gazette* (vol. xxi., p. 177), of a man who swallowed four or five tablespoonfuls of cream of tartar, to counteract the effects of drunkenness, and died in the course of three days, after

much pain, violent vomiting, and other symptoms of gastro-enteritis. His stomach and intestines were found to be much inflamed.

Cases of this description possess great interest to the Pharmaceutical Chemist, who is at all times liable to be called upon to give evidence as to the properties, doses, and constitution of any substance which may be suspected to have occasioned death; and a neglect of that education which alone can qualify a person for giving such evidence, may entail upon him much discredit and mortification.

We take this opportunity of adverting to the frequent applications which are made to Chemists for medicines to procure abortion, which subject has lately been alluded to by some of our correspondents. It ought to be generally understood, that to supply any medicine for this purpose is not only unjustifiable in a moral point of view, but the offender is liable to the most severe punishment which the law can inflict. The prevailing opinion that some substances act specifically in the above manner, is an error; and the effect can only be produced indirectly by so far reducing the powers of the system, as to endanger the life of the mother as well as that of the child.

In the above instance no blame whatever is attached to Mr. Sadler, who was not made acquainted with the criminal intentions of the party purchasing the sulphate of potash; and whose evidence, at the inquest, was perfectly clear and consistent; but had he been informed to what use the salt was to be applied, he would not have been justified in selling it for such a purpose.

On the 18th of October, a letter, signed "A Surgeon," appeared in the *Times*, in which the author speculated upon the probability of the sulphate of potash, which was administered to Mary Haynes, having been contaminated with some metallic poison. The grounds upon which he entertained this suspicion were stated to be, that "sulphate of potash, when in a state of purity, is nothing more than a saline purgative; and although the dose given by the husband was certainly excessive," he did not believe that it would have been sufficient to cause death, had the drug been pure. Secondly, the author stated, that "sulphate of potash is the residual salt left after the preparation of nitric acid, saturated with an extra quantity of carbonate of potash. Nitric acid is obtained by the action of sulphuric acid, or of iron pyrites on nitrate of potash; and it is a well-known fact, that the oil of vitriol of commerce and iron pyrites contain arsenic, zinc, or copper, which may, during the process, be readily transferred, either as a whole or a part, to the residual salt of potash, thus contaminating it with a most dangerous poison." He alluded to the cases reported on the continent, in which death was said to

have been occasioned by sulphate of potash, and mentioned one instance, in which M. Moritz had found a notable quantity of zinc or copper in the salt. The letter concluded with a recommendation to Messrs. French and Sadler to submit to chemical analysis the salt which remained in the bottle.

In consequence of this letter a portion of the salt was submitted to Professor Brande for analysis, and the following is a copy of the Professor's certificate:

"*Royal Mint, Thursday, Oct.* 19*th.*

"Sir,—I have carefully examined the sample of sulphate of potash, brought to me yesterday by your messenger.

"I find no trace in it of arsenic, lead, copper, antimony, or any other metal; it is a pure and neutral sulphate of potassa.

"Yours faithfully, William Thomas Brande.

To Mr. French, 18, *Norton Folgate.*"

This statement was fully confirmed by Messrs. Howard and Kent the manufacturers of the article, who were enabled to vouch for its purity.

DEATH OCCASIONED BY LAUDANUM.

The *Carnarvon and Denbigh Herald*, of October 7th, contains an account of the death of two infants, the children of Mr. and Mrs. Rogers, of Carnarvon, in consequence of the administration of laudanum by the servant. The following are the particulars of the case, as they transpired at the inquest:

Mrs. Rogers, observing at half-past eight on Saturday evening, October 1st, that the youngest child (nine weeks old) was unnaturally drowsy, and breathing with difficulty, sent for Mr. W. R. Williams, surgeon, who found the child insensible and in a convulsive state. The convulsion was chiefly in the face and upper extremities, and the symptoms denoted the action of a powerful narcotic. Mrs. Rogers, on being interrogated, said that no narcotic had been administered, but that she had sent the servant for "three-halfpennyworth of gin to make punch for the baby and the elder child" (a year and seven months old). She was positive she had ordered nothing but gin. Mr. Williams prescribed a warm bath and a clyster, after which he administered a small quantity of croton oil in syrup. The child appeared to revive, and he did not see her again until seven in the morning.

The elder child, who at bedtime appeared in good health, was seized with convulsions about two o'clock. The means recommended for the other child were resorted to in the hope that they would produce the desired effect, and no medical man was sent for until six in the morning; but before the arrival of Mr. Williams, the child was dead. The infant expired at nine o'clock.

Mr. Roberts, surgeon, who was called in at eight in the morning, corroborated the testimony of Mr. Williams, in reference

to the symptoms of the youngest child, which he ascribed to a narcotic poison; and after some investigation the upper nursemaid admitted, that she had sent her fellow-servant for a pennyworth of laudanum, and had administered a portion to each of the children for the purpose of inducing sleep during the night. The eldest child had some gin likewise.

Mr. W. P. Williams (chemist) deposed that he had supplied the laudanum; he gave one drachm. As the quantity was small, and he was busy at the time, he did not label it, which omission was at variance with his usual practice.

Mr. Williams (the surgeon) considered that from eight to fifteen minims of laudanum might cause the death of children so young as the deceased. Mr. Roberts gave a similar opinion, and also stated that death might be occasioned by a quantity so small as to escape detection by smell or chemical means on a *post mortem* examination.

On account of this admission, the coroner refused to issue an order for the examination, considering it unnecessary, especially since the administration of laudanum had been proved.

The coroner, in charging the jury, stated that it was for them to consider whether the laudanum which had been given had occasioned death, and if so, whether the verdict should be *manslaughter*, or *misadventure*. There being no evidence whatever of malice or intention, *murder* was out of the question. He read a passage in which Mr. Jervis describes the distinction between the administration of drugs by a professional man, and by a person not duly authorized to administer them, and observed that the recklessness implied in the act of presuming to administer active and dangerous medicines without competent knowledge and authority, might bring the issue, if death ensued, under the case of manslaughter. *If a medical person had erred in judgment as to what was a proper dose, the result, if fatal, could only be regarded as death by inadvertence: but when non-medical persons take upon themselves to meddle with drugs, they do it on their own responsibility.* The servant had received no authority or permission from the mother of the children to administer laudanum, although she had been authorized to give a little gin. That she knew she had been to blame, was obvious from the fact that, in the first instance, she denied having administered laudanum; which denial was to be regretted, as it prevented the timely application of proper remedies. The grief which she evinced at the result of her imprudence, was in her favour; and the younger servant having merely acted as an agent in fetching the laudanum could not be implicated. The Jury returned a verdict of *Manslaughter* against the elder nursemaid on both inquisitions.

An Inquest was held at the "Gun Tavern," Pimlico, on Thursday evening, October the 5th, on the body of an infant, the natural daughter of a young woman, lately stillroom-maid in the Oxford and Cambridge Club-house, Pall Mall. On the previous Monday, the child was very restless, and the mother, in order to give it relief, administered half a teaspoonful of laudanum in some gruel. The child remained easy for some hours, and then fell into a stupor, from which it did not recover, but died in the afternoon.

Notwithstanding the repeated cautions which have been given to the public respecting the danger of administering opiates to young children, the practice prevails to so great an extent that it is impossible to estimate the amount of mischief which results from it. Godfrey's Cordial is considered by many ignorant persons a panacea for all the ailments of children, and, in many of the cases in which it is resorted to, it is in fact the worst thing which could be given. In some of the manufacturing districts, especially where the majority of the persons employed are women, the children, being deprived of the care of their mothers during a large portion of the day, are kept quiet by means of Godfrey's Cordial. By the constant repetition of this unnatural sedative, their constitutions become so far accustomed to its action, that the dose is, in many cases, increased to an almost incredible extent, in order to produce the desired effect. Their health becomes undermined, and their miserable and emaciated condition, denotes the joint influence of neglect and slow poison.

DEATH SUPPOSED TO HAVE BEEN OCCASIONED BY AN OVERDOSE OF MERCURY.

Mr. Baker held an inquest at the "Woolsack," Brick Lane, St. Luke's, on the body of Mr. Francis Chalkley, aged forty, a butcher. Mr. Mark (surgeon), of Nelson Street, City Road, said he had attended the deceased from August until Tuesday last (about six weeks), when he died. The witness attributed his death to an overdose of mercury, consisting of three grains of calomel and six grains of blue pill, which had been taken at bed-time, and followed by an ordinary black draught in the morning. Witness considered the dose inordinate, and sufficient for at least three persons! When he was called in, he found the mouth of the patient affected by mercury, on which, together with the appearances observed on the *post mortem* examination, he founded his opinion as to the cause of death.

It is important to observe, that at the time this evidence was given, it was supposed that the prescription had been written by

an unqualified practitioner; but this was contradicted by Mr. Dickinson, the author of it, who sent a letter to the *Times*, on the 3d of October, stating that he had been in practice above thirty years, detailing the particulars of the case, and the circumstances under which he ordered the medicine, and at the same time calling in question the judgment and professional fairness of Mr. Mark, in representing three grains of calomel and six of blue pill to be an *inordinate dose, sufficient for three persons.* Mr. Dickinson admitted, that when he saw the patient two days after he had taken the pills, he found him under the influence of mercury, which he ascribed either to some idiosyncracy of constitution, or to exposure to cold and damp atmosphere. The patient, on being asked whether he had taken any other medicine, admitted that he had taken some pills of the composition of which he was ignorant. From the suppression of these circumstances at the inquest, Mr. Dickinson inferred that the cause of death had not been satisfactorily proved, nor properly investigated.

THE SALE OF SPIRITS OF WINE.

Mr. Woolley (Secretary at Manchester) informs us, that the case of Mr. Holyoake has terminated; the Board of Excise having intimated to him that the charge against him is withdrawn, not, however, in time to save him from the expense of retaining counsel, and of other preparatory measures. This case is an illustration of the arbitrary power possessed by the officers of excise, in annoying individuals. (See our last No., p. 167.)

A general order was recently issued by the Board of Excise, and copies of it were transmitted to the various district officers, who were instructed to wait upon the Apothecaries and Chemists in their respective localities, in order to place every individual in possession of the needful information respecting the intentions of the Board. Wishing to give our readers an authentic copy of this document, which we had not been able to obtain, we applied personally at the General Excise Office for a printed copy. This was refused on the ground, that no orders had been received to furnish it to individuals in the trade, it having been issued for the use of the excise officers. We were not even favoured with a sight of the document; in fact, we have reason to believe that the subject is still under consideration.

With some difficulty we have succeeded, through another channel, in obtaining the order, which is subjoined. Our readers will perceive that it is not in accordance with the answer given by the Commissioners to the deputation of Chemists and Druggists during the month of March (see vol. ii. p. 595). It is satisfactory

to find that the law in its present state not only puzzles the lawyers, but that even the Commissioners themselves vary their interpretations of it from time to time. No stronger proof could be advanced of the necessity of some alteration or amendment.

"GENERAL ORDER.

"*Excise Office, London.* } 12*th Sept.*, 1843.

"It having been discovered that various Apothecaries, Chemists, and Druggists, have been selling spirits of wine in a *pure and unmedicated* state, by which they have incurred the £50 penalty, by 6 Geo. IV., c. 81, sec. 26, for retailing spirits without licence, and various other penalties for not making entry of the premises, and receiving spirits without permit.

"Ordered,

"That the attention of the several collectors, supervisors, and officers in the United Kingdom, be directed to the subject, and that the officers call upon the different Surgeons, Apothecaries, Chemists, and Druggists in their respective Divisions and Rides, and respectfully explain to each of them the liabilities which they will incur under the above law, should they sell pure and unmedicated spirits of wine without entry and licence. And if any cases be discovered, where such practices are continued after the parties have been cautioned, the same must be stated to the Board for prosecution.

"A Memorandum must be entered at the end of the General Entry Book, of the date when, and the names of the persons to whom this order shall have been communicated by the officers respectively.

"(By the Board) CHARLES BROWNE."

TO CORRESPONDENTS.

In answer to the enquiries of "Oj," in our last number, we have received several communications, containing formulæ for

BRASS POLISHING PASTE.

(No. 1)—Rotten Stone, 2 parts—Soft Soap, 1 part—Oil of Amber, $\frac{1}{16}$ part.

(No. 2.)—Oxalic Acid, 2 oz.—Soft Soap, $\frac{1}{2}$ lb.—Sweet Oil, $\frac{1}{2}$ lb.—Oil of Amber, 1 oz.—Rotten Stone, $4\frac{1}{2}$ lb.—Boiling Water, 1 lb. Mix.

Some Correspondents recommend the substitution of Spirit of Turpentine and Sweet Oil, for Oil of Amber. On using the above, a sufficient quantity of water is to be added to reduce it to the consistence of cream.

FURNITURE PASTE.

	No. 1.	No. 2.	No. 3.
Bees Wax	4 lb.	$1\frac{1}{2}$ lb.	1 lb.
Spirit of Turpentine (coloured with alkanet root)	8 lb.	1 lb.	1 lb.
Rosin	1 lb.	—	—
Linseed Oil	—	—	1 lb.

FURNITURE CREAM.

(No. 1) :—Spirit of Turpentine thickened with White Wax.

(No. 2.) Linseed Oil, $2\frac{1}{2}$ lb.—Distilled Vinegar, 6 oz.—Spirit of Turpentine, 3 oz.—Hydrochloric Acid, 1 oz.—Spirits of Wine, 2 oz. Mix.

(No. 3.)—Bees' Wax, 3 oz.—Pearl Ashes, 2 oz.—Water, 6 oz. Mix with heat and add, Boiled Oil, 4 oz—Spirit of Turpentine, 5 oz. Mix.

PRESTON SMELLING SALTS :—The bottles to be filled with Carbonate of Ammonia in small pieces, and one drachm of the following mixture to be added to each : Oil of Bergamot, ℥j.—Oils of Cloves and Lavender, each ℥ss.—Strongest solution of Ammonia, ℥ij. Mix.

One of these Correspondents also gives the following formula for FRENCH POLISH :—Shellac, ℥vii.—Oxalic Acid, ℥j.—Naphtha, ℥iv. Dissolve, and then add, Linseed Oil, ℥j. Mix.

W. A. H. — To gild German Silver by the electrotype process, dissolve two ounces of Cyanide of Potassium in a pint of warm distilled water, to which add a quarter of an ounce of Oxide of Gold. Let the German Silver or other article be well cleaned from grease and sand, then dipped in dilute nitric acid. A single cell or the battery process may be employed.

P. B.—Strontia and Strontian are synonymous terms, meaning the oxide of the metal Strontium.

J. W. Williams wishes to know if there is "any method of preserving the sweets of cider." Not being practically acquainted with the manufacture of cider, we are unable to answer, nor, indeed, do we distinctly understand, this question.

"Θ." inquires, "When *Opium* is ordered in a prescription, which kind of the drug is to be used, Opium, dried Opium, or powdered Opium?—Answer, *Opium*. The definition of the term in the Pharmacopœia is—The concrete juice of the unripe capsules of Papaver somniferum.

P.—Crystallized Carbonate of Soda is ordered in the Pharmacopœia to be used in estimating the strength of Acetic Acid. This salt, if pure, is uniform in its strength, containing ten equivalents of water. The specific gravity of the acid is very easily taken.

"Calamus."—The *Ceratum Plumbi Compositum* of the Pharmacopœia is generally sold for Goulard's Cerate. The formula for this differs from Goulard's original recipe, in ordering Camphor, while the other directs a large quantity of water to be mixed with the Cerate. Liquor Potassæ, when diluted, may be coloured with Tincture of Catechu.

A. P. S.—*Verjuice* is the expressed juice of the wild apple, or crab, which has undergone the acetous fermentation. On the Continent it is made from the grape.

A. Y. B.—An Ethereal Tincture of Cantharides — one part of cantharides to eight of ether—makes a good vesicating fluid.

"An Associate."—We know of no good chemical test, by which to detect the presence of capsicums in powdered black pepper. The microscope would probably be the best means.

A. B. C.—We are not acquainted with any good filtering machine that we could recommend for tinctures, wines, &c. Several contrivances for this purpose have been introduced, but we continue to use the funnel and filtering paper.

"An American."—To obtain cod-liver oil, tie up the livers in a cloth or bag, and boil them in water until the oil rises to the surface, when it is to be collected and filtered.

M.P.S. wishes to know how he can recover the excess of copper from a cobalt colour, to which sulphate of copper was added. [We think the expense of restoring the colour to its original state would be greater than that of making a new one].

Pharmacopolist.—Iron filings may be separated from particles of copper by means of a magnet.

H. A. T. thinks the Pharmaceutical Journal ought not to be the vehicle for inquiring into the properties of various secret medicines, and publishing private formulæ, which practice he considers unjust to individuals, and calculated to give rise to fraud and to engender ill feeling among our Members. [We should be extremely sorry, while obliging one Correspondent to injure or give offence to another. It is not an easy task which we have to perform, for while one Correspondent thinks we publish too much, others complain that our Answers are not sufficiently explicit.]

Mr. Setchfield thinks we ought to give more practical information; and wishes to know the method of obtaining pyroligneous acid. [Dr. Ure's description of the process occupies two pages of small print with a woodcut, which we cannot condense into our space, and therefore refer to the Dictionary of Arts and Manufacturers, page 1052.]

Mr. Sully has sent a sample of succedaneum for the teeth, composed of bismuth ʒviij, lead ʒv, tin ʒiij, melted in a crucible with "mercury in a sufficient quantity, that when a little of the fluid metal is poured on the hand, the heat can be borne comfortably." [A *cat's paw* would be useful in testing this compound.]

"An Associate" (Knightsbridge).—We have not seen any published formula for "Solution of Myrrh and Borax."

G. I. A. (Liverpool).—Neither have we seen "crystallized oil for the hair." "Lip salve balls," consist of camphorated wax cast in a mould.

K. P. M. (Leeds).—Formulæ for freezing mixtures may be found in almost every work on Chemistry. One of the best consists of equal parts of nitrate of potash and sal ammoniac.

A. M. P. S.—Oj in a prescription signifies twenty ounces. Whether Physicians always use it in this sense, or not, is a question which we cannot answer. Gum is not so good a vehicle for suspending spermaceti as the yolk of an egg, and cannot be made to form an elegant mixture.

"Tyro" (1.)—Carbonic acid, when it enters the *lungs* acts as a narcotic poison — a result which does not occur when it is taken in an effervescing draught into the *stomach*. Pure carbonic acid causes spasm of the glottis, and does not enter the lungs.—(2.) Dilute the acid.—(3.) Red oxide of mercury is liable to decomposition: when oxygen is given off, the metal or protoxide is left, which gives the ointment a gray colour.

"Tyro" (No. 2.)—Substances which are incompatible in mixtures are also incompatible in pills. Decomposition does not of necessity imply incompatibility. It is not, however, our place to go into this subject, which is the province of the Physician.

R. H. B. (Plymouth) inquires: 1. Whether Chemists are justified in having the words Medical Chemist over their doors? 2. To what extent are Chemists justified in prescribing? 3. And whether the Society recommend Chemists to emigrate? [1. The term Medical Chemist being equivocal, is objectionable. 2. See vol. i. page 176. 3. If half the Chemists in Great Britain would emigrate, they would oblige the other half.]

"Bestanum."—Such advertisements are disreputable and improper.

M. D. draws our attention to the reprehensible practice of giving "testimonials," and "cases of cure," as a puff for quack medicines, and encloses a specimen emanating from a member of the Pharmaceutical Society. We quite agree with our Correspondent in the opinion that such practices are disreputable and detrimental to the character of the parties implicated. At the same time we must confess that this is the first case of the kind which has come before our notice of a Chemist lending his name to a quack. The testimonials which we usually meet with in such cases are signed M.D. or M. R. C. S.

"Frater" (Newcastle) has sent a curious specimen of a shop-bill, issued by a person calling himself a "Chemist and Druggist, Vinegar, Blacking, and Ink Manufacturer, and General Dealer, wholesale and retail."

Another Correspondent (Stokesley) has sent two bills of a similar description. We have also received one from Bath. These documents are so remarkable, that we intend, at a future time, to publish extracts from them as well as others of the genus for the amusement of our readers, and in order to point out the necessity of establishing an effectual distinction between the Genuine Chemist and the General Dealer.

"Stopper" wishes us to caution our readers "respecting an impostor, who is going round town to Chemists and Druggists with marking-ink, stating that it contains no silver and will bear any test." We are informed that one of our Members found it necessary, not long ago, to expose the same person by public advertisement. [Our Correspondent states, that he has enclosed the receipt, but this has not come to hand.]

R. S.—We believe no restrictions exist in India respecting the opening of Chemists' shops.

"PUBLICOLA" being one of the original Associates, may, on commencing business, on his own account, become a Member without examination, and continue so as long as he remains in the business. The works named are the best we are acquainted with on the subject. "Field's Veterinary Records,' lately published by Longmans, might also be useful.

An A.P.S.—Pereira's Materia Medica is £2 : 10*s*. The Second Edition has not been long published. The Treatise on Diet, by the same Author, is 16*s*.

J.E.L., A.P.S., inquires if such a preparation exists as Æther Chlorinat. ? —[We presume our Correspondent alludes to chloric ether.]

"PHARMACIEN."—The substitution o foil of bitter almonds for the almond cake, in making the bitter almond water, is objectionable; as the oil of bitter almonds undergoes considerable change from exposure to the air and light, hydrocyanic acid, an important constituent, being given off, and hydruret of benzulc, the other constituent, being partially converted into benzoic acid. On this account it is desirable to use the water recently distilled from the cake or almond, whenever this is practicable, although it may be allowable under other circumstances, and upon an emergency, to prepare it by impregnating distilled water with as much of the essential oil as it will take up, provided the oil has been kept in a well-stopped bottle, and is not very old.

"JUVENIS."—There is evidently a typographical error in the sentence alluded to; *sesquioxide* of iron is mentioned twice, whereas the first time it should be *protoxide*. The earthen tubes employed in galvanic apparatus may be obtained of any of the dealers in electrical apparatus.

W. A. W. Being entirely a medical question, we cannot give any advice upon it.

"QUÆSITOR." (No. 1.)—See vol. ii., page 656, of this Journal.

"QUÆSITOR."—(No. 2.) Associates become admissible to the major examination as soon as they have determined upon commencing business on their own account. A government stamp is applied to authentic weights and measures. It is nevertheless difficult to obtain any minute weights perfectly accurate. Graduated glass measures should be verified before being used.

"NON ULLUS," &c. (Isle of Wight.)—See vol. ii. page 5.

"OMEGA" and "Z."—See the article on the Examination of Associates. Vol. ii., No. 8, p. 481.

M. P. S. suggests the plan of selling a "rectified tincture of alkanet root" (℥iv. to the gal.), for cleaning plate, burning, &c. to escape the penalty.

"PHARMACIEN" inquires whether it be lawful to sell spirits disguised with camphor as "medicated spirit of wine?" [All evasions of the Act are attended with some risk.]

Mr. OWEN mentions "An Act to repeal several Duties payable on Excise Liquors in Great Britain, and to impose other duties in lieu thereof, and to amend the Laws for granting Excise Licenses," 6th Geo. IV. cap. 81, which was omitted in our list of acts relating to the sale of spirit of wine, p. 189.

Z. Z.—See vol. ii. p. 724. In some cases an interval of several months has intervened between the sale of spirit of wine and the information.

L. M.—See vol. iii., page 54.

A. M. B.—See vol. ii., p. 403.

W. H. P., M.P.S.—(1.) See notice inside the cover of vol. iii., No. 3. (2). See vol. ii., pages 613 to 618.

Advertisements to Mr. CHURCHILL, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. SMITH, 17, Bloomsbury Square.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. VI.—DECEMBER 1st, 1843.

REMUNERATION FOR LABOUR.

Although we have dwelt at some length on the paramount importance of scientific knowledge to the Pharmaceutical Chemist, it must be confessed that the incentive to exertion, and in fact the legitimate object of business in general, is remuneration. Abstractedly speaking, the education of a philosopher is not that which is particularly calculated to make a man a successful tradesman, and since the business of a Chemist is intermediate between a learned profession and a mere trade, it is our duty not to overlook those considerations, which have reference to the substantial returns derivable from skilled labour. Having become possessed of the requisite educational qualifications, the nature and extent of which we have already discussed, the Chemist should endeavour to form a correct estimate of the value of his time and skill, which items become involved in the calculation of the cost-price of his commodities. These items should be considered apart from that which is correctly denominated *profit*, since every man is entitled to receive, in addition to a fair per-centage of profit on his capital, an equivalent for the expense and labour of learning his business, the amount of which equivalent must be regulated by circumstances relating to the particular nature of his occupation.

Adam Smith very justly observes, that "the five following are the principal circumstances which make up for a small pecuniary gain in some employments, and counterbalance a great one in others:—First, the agreeableness or disagreeableness of the employments themselves. Secondly, the easiness and cheapness, or the difficulty and expense of learning them. Thirdly, the constancy or inconstancy of employment in them. Fourthly, The small or

great trust which must be reposed in those who exercise them; and, fifthly, the probability or improbability of success in them."

Applying these several circumstances to the particular business under consideration, we may remark—

First, that the occupation of the Pharmaceutical Chemist subjects him to great privations. All his hours are hours of business. His daily toil is spread over, on an average, *fifteen or sixteen hours;* and during the night he is liable to be called upon to minister to the urgent need of his customers. His labour, although requiring but a moderate degree of muscular strength, is wearing to his constitution, on account of the incessant application of body and mind to one pursuit, and the confined and frequently unwholesome atmosphere in which he lives. While preparing remedies to relieve the ailments of others, it too often happens that he injures his own health, and is obliged to relinquish the pursuits in the study of which he has expended many years of his life. These circumstances very properly enhance the wages of labour in the case of the Pharmaceutical Chemist.

Secondly, the education which he ought to undergo is attended with much labour and expense. The classical education, in the first instance, the premium on apprenticeship, the fees for attendance of lectures, the purchase of books and apparatus—these expenses are within the reach of those persons only whose station in life is respectable, and whose labour is increased in value by the extent of their acquirements. *Those who have not been properly educated are of course in fairness entitled to a much smaller amount of remuneration.*

Thirdly, with respect to the constancy or inconstancy of employment, although the daily toil of the Chemist is spread over *fifteen or sixteen hours,* besides occasional night-work, the amount of business transacted fluctuates in a remarkable degree. Medicine is not, like bread, meat, or groceries, a necessary of life in *daily* requisition. It is only resorted to occasionally by those whose disordered health constitutes not the rule, but the exception. During the prevalence of an epidemic, at an unhealthy season of

the year, or on other occasions favourable to the propagation of disease, the Chemist is probably overdone with work, and harassed with the anxiety attending his responsible avocation ; at other times he may stand for hours behind his counter, without a customer ; and on a wet day his total receipts may sometimes be scarcely sufficient to pay rent and taxes. Consequently the occupation of the Pharmaceutical Chemist is by no means constant, and the value of his labour must rise in proportion to the amount of fluctuation in his employment.

Fourthly, the trust reposed in those who prepare the remedies for the sick, is second only to that which belongs to the medical practitioner — it is a case of life and death ; every dose which is administered places the safety of the patient in the hands of the compounder. Not only, therefore, is the Chemist responsible to the public in reference to the amount of his qualification, but no less faith must be reposed in his moral integrity by those who trust their lives in his hands. In cases of this kind it is needless to remark, that the man who possesses the full confidence of his patrons or employers can generally command a proportional remuneration for his labour.

Fifthly, the probability or improbability of success affects the wages of labour ; and, in this respect, again, the Chemist is not more blessed than other classes of the community. On the contrary, we need scarcely inform our readers, that a young man who embarks his capital in the perishable commodities which are comprised in a Druggist's stock, unless he enjoy unusual advantages in regard to connexion, patronage, or demand for drugs in his particular locality, has reason to anticipate, when he commences business on his own account, an uphill course, attended with much anxiety and privation for several years at least ; and, if it were worth while to collect statistical evidence on the subject, it would be easy to prove, that a very large majority of the trade, even after they are well established, gain with difficulty a bare subsistence. That these evils are very much increased by the want of system among our body, and the consequent inroads of

unqualified persons, there is no reason to doubt; and we may hope that the movement which is now in progress among us will, in process of time, effect a reformation, not only in the professional character of the Pharmaceutical Chemist, but also in the amount of just remuneration for his labour. Under any circumstances, the risk, in the case of the Chemist, may be considered to exceed the average when compared with that which attends other branches of ordinary trade. The butcher and the baker are quite sure of success, within certain limits, which are regulated by the extent of the population in the district. Most persons can judge of the quality of bread and meat, and must have a daily supply; consequently a moderate attention to business will ensure to the butcher and baker the patronage of their neighbours. But the public, not being learned in physic, will not place confidence in a stranger whose qualifications and character rest upon the testimony of his blue-bottle and his shop-bill. He must, therefore, expect to wait, probably many years, before he obtains the patronage of his neighbours, who, in the interim, instead of going to the nearest shop for medicine, which is not an article of every day consumption, take any opportunity which may occur of obtaining it elsewhere, according to prejudice or habit. Since, then, the chances of success, in the case of the Chemist, are less than in that of ordinary mechanical trades, the wages of his labour ought, in fairness, to be greater in the same proportion.

It is important to notice the influence of the five circumstances above enumerated, on the occupation of the Pharmaceutical Chemist, for, as Adam Smith observes, "the apparent difference in the profits of different trades, is generally a deception arising from our not always distinguishing what ought to be considered as wages, from what ought to be considered as profit." Our object is not to advocate exorbitant profit, but to show that those who overlook these facts, and estimate the cost of their goods by the price which they pay for them in the market, are, in many cases, transacting business absolutely at a loss, because they charge little or nothing for labour, which is generally an item of considerable

amount. Those who profess to prepare prescriptions for the price of the ingredients, and who offer Seidlitz powders, Soda powders, and pills of various kinds, at the rate at which they would sell the materials by the ounce or the pound, are on a par with some of the advertising linen-drapers, who recommend themselves to their customers by asserting, that they "sell every article under prime cost, but make their profit by the extent of their business."

The dispensing Chemist who falls into the above error, imagines that he is gaining a profit on each transaction, because, according to the wholesale price-list, he could replace the articles for less money than he receives for them; but at the end of the year, he is surprised to find that instead of having a balance in hand to pay his wholesale Druggist, he is obliged to ask for credit. He attributes this want of cash to the hard times, depression in trade, the influence of competition; in short, to anything but the real cause—namely, an error in his own calculation of the labour, which forms a serious item in the cost of his stock.

There is another item which is overlooked in such cases, namely, the expense of keeping up an establishment for carrying on business. This resolves itself into several heads—rent, taxes, breakage, deterioration of stock, unavoidable waste, wear and tear of apparatus, and bad debts. The amount of these expenses varies according to the extent of the business transacted, the particular nature of the business, and other accidental circumstances; but in some cases, the *charges* amount to more than half as much as the original price, or what is called the *prime cost of the stock.*

Consequently the *actual cost* of the stock consists of three parts: the price originally paid for it, the wages of labour in manipulating it, and the expenses of keeping up the establishment. But in addition to these items, every man is entitled to receive a certain percentage on the capital which he employs, and this is what may be correctly denominated *profit.*

The profit constitutes the means of subsistence of himself and his family, and to this he must look for the chance of providing against the casualties to which all are liable, by accumulating a fund for his support when advanced years or ill health incapacitate

him for exertion. The amount of profit is regulated by circumstances, as, for instance, the extent of business, the risk attending it, the exclusive possession of any particular secret, &c. The difference in the amount of profit according to the extent of business, is more apparent than real; for although a person whose business turns over a capital of £20,000 may be remunerated with a much smaller per-centage of profit than one whose whole stock is not worth £300, a large proportion of what appears to be profit in the latter case, is, in fact, the wages of labour. There is, however, some difference in the actual profit; since, putting wages out of the question, every man ought to be able to live by his trade, and if the returns of any particular description of business are too small to afford a living on the ordinary calculation of profit, something extra must be allowed. With respect to risk, it is obvious, that the profits of a speculative business are governed by no rule, and the loss, in some cases, must be compensated by extravagant profits in others. The inventor of an improved process, or the possessor of any secret in manufacture, which occasions a material saving of expense, is entitled to enjoy the benefit of his superior skill and ingenuity; and so long as he maintains the exclusive possession of his secret, he can command an extra profit, which is limited only by the extent to which his knowledge gives him an advantage over his competitors.

From the facts above stated, we may deduce two important conclusions:

First, that the Pharmaceutical Chemists of this country are very inadequately remunerated for their labour.

Secondly, that the *actual cost* of the Druggist's stock is resolved into several parts, of which the price originally paid for the drugs in their simple state, forms so small a proportion, that the actual difference between the expense of medicine of the best and second quality, is very much less than the apparent difference according to the prime cost of the article. Consequently, the saving which is effected by the purchase of inferior drugs is much more insignificant than is generally supposed, and is a very paltry return for the loss of character resulting from such practices.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

On the 25th of October, Mr. Fownes delivered

A LECTURE
ON THE RADIATION, REFLECTION, ABSORPTION, AND TRANSMISSION OF HEAT.

Of which the following is an abstract:

The invisible rays of heat thrown off in straight lines and in all directions from hot bodies, are subject to laws apparently identical with those that govern light. They are reflected from bright surfaces, absorbed by dull ones, and transmitted, with greater or less facility, by certain transparent substances, undergoing refraction, and even polarization, in the same manner as the rays of light.

The reflection of heat follows exactly the same law as that of light; the *incident* and *reflected* ray are contained in the same vertical plane, and make equal angles with the reflecting surface, or with a perpendicular to that surface. The fact is most forcibly illustrated by means of a pair of large parabolic mirrors of silvered or tinned copper, placed opposite to each other, with their axes coincident, but separated by an interval of twenty feet or more. On placing a piece of dry amadou in the focus of one of these, and a red-hot ball in that of the other, the tinder will take fire; the rays emitted from the ball, and which become incident on the first mirror, are all reflected in a direction parallel with the axis of the curve. On reaching the second mirror, they again suffer reflexion, and meet each other, or cross at the focal point, when a great elevation of temperature is in consequence produced.

The emissive power for heat of different bodies varies very much; two metallic vessels, exactly similar in shape and dimensions and other particulars, one brightly polished, and the other covered with a coating of lamp-black or soot, filled with hot water at the same temperature, and left to cool side by side, are found to lose heat unequally. The black vessel cools by radiation so much faster than the other, that after the lapse of half an hour or more, a difference of eight or ten degrees will often be found between them. The late Sir John Leslie made, by a more accurate method of investigation, a great number of experiments on the relative emissive power of various substances; lamp-black

was found to stand first in the scale, and polished metals last plumbago, tarnished metal, glass, &c. hold an intermediate rank. The mere condition of the *surface* itself has been found by some recent and careful experiments to be without influence; the effects of scratching and abrasion, in the case of metals, observed by Leslie to increase the emissive power, being referred to a superficial increase of density in the metal, the result of compression.

The power of absorbing heat is, as nearly as can be judged, in *direct* proportion to the emissive power, and in *inverse* proportion to the faculty of reflexion. Two similar screens of tin-plate—the one blackened, and the other polished, exposed under similar circumstances to radiant heat, have their temperature unequally raised, the black one becoming hottest. The thinnest film of gold-leaf defends paper from scorching when a red-hot iron is held over it, by reflecting most of the heat which falls upon it. The phenomena of dew, and of the land and sea breezes of tropical climates, are dependent on the principle of radiation and absorption.

Certain transparent bodies, as glass, have long been known to transmit rays of heat, but not always with the same facility. Heat from the sun passes through glass with comparatively little interruption, while that thrown off from a common fire is almost completely intercepted by a screen of that substance. The full investigation of this interesting subject is due to M. Melloni. By taking advantage of two facts previously known, viz., the definite action of an electric current on a magnetic needle, and the production of a current by the unequal heating of two metals placed in contact, that gentleman was enabled to construct an instrument very far surpassing in delicacy and quickness of indication the most sensitive air-thermometer. When a wire conveying an electric current is brought into the neighbourhood of a poised magnetic needle, the latter is deflected from its position, and found to assume a new one, making an angle of greater or less magnitude with the wire itself. The direction of the motion of either pole, depends on the direction of the current, and the position of the wire with respect to the needle, *i. e.* above or below it; the effect being reversed by such change of position. It will be easy to understand, that a wire bent upon itself, in such a manner that the needle may lie between the two portions, will produce a double effect, every part of the current concurring in urging the needle in the same direction, and by causing the wire to make a number of turns round the needle, this effect may be indefinitely increased—such is the principle of the galvanoscope, or multiplier.

The feeble electrical current produced when two portions of different metals with their opposite ends in contact, have these

junctions unequally heated, may be greatly raised in energy by repeating the alternation, as when a number of small bars of antimony and bismuth, the two metals most powerful in this respect, are arranged side by side without touching, and their alternate ends soldered together. Such a thermo-pile was employed by M. Melloni, in conjunction with a delicate multiplier. Four distinct sources of heat were employed in these experiments, viz., the flame of an oil-lamp, a coil of red-hot platinum wire, blackened copper heated to 734°, and the same heated to 212°. The substances to be tried were cut into plates, and mounted in perforated screens, which were successively interposed between the source of heat and the blackened face of the thermo-pile; the effect produced on the galvanoscope was taken as an indication of the comparative transmissive power of the substance.

It was soon found that no direct relation existed between permeability to light, and permeability to heat, further than that bodies *absolutely* opaque, were quite destitute of the power of transmission. Bodies equally transparent to light, were by no means equally so with respect to heat. Rock-salt, glues, and alum, present a remarkable contrast; thus similar plates of the bodies transmit heat from the lamp-flame in the proportion of the numbers 92, 39, and 9. The interposition of a second plate of the same substance, produced comparatively little diminution in the effect. Colour generally interfered with the transmissive power, but in a manner perfectly anomalous. Rays of heat from different sources have different properties; thus equal quantities of heat from the four sources mentioned, being suffered to fall successively on a plate of glass, the quantities transmitted were expressed by the numbers 39, 24, 6, and 0; the glass is thus seen to be opaque to heat emanating from a source at 212°.

These, and a number of equally curious and interesting results, are all explained by supposing that differences exist among the invisible rays of heat analogous to those differences in the luminous rays called colours. Such heat-tints have no direct relation to ordinary colours.

Of all substances tried by M. Melloni, rock-salt is the only one equally transparent to every kind of heat-ray. This body is to heat what clear glass, rock-crystal, water, &c., are to light, *i. e.* equally transparent to light of every colour. The term *diathermanous* is employed to designate transparency to heat.

By cutting transparent rock-salt into prisms and lenses, the refraction of rays of heat may be very beautifully shown.

Lastly, Rays of heat have been polarized by transmission through thin plates of tourmaline.

PHARMACEUTICAL MEETING,

NOVEMBER 8th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON THE FORMATION OF HYDROCYANIC ACID IN THE PREPARATION OF SPIRITUS ÆTHERIS NITRICI.

BY MR. WILLIAM BASTICK.

In Germany, it is customary among Pharmaceutists to use sugar or starch in conjunction with nitric acid for the development of hyponitrous acid, in the preparation of spiritus ætheris nitrici—a practice recommended by Liebig, and described by Dr. Pereira in his excellent work on Materia Medica.

An Apothecary of Berlin was led to believe, that hydrocyanic acid was generated in the spiritus ætheris nitrici, from the peculiar odour which it possessed when prepared in this manner.

At the suggestion of Professor Liebig, I undertook to examine the fluid obtained by this process, to see if the above surmises were correct; and I succeeded, by the most unequivocal tests, in showing the presence of hydrocyanic acid in it, especially when the receiver was kept sufficiently cool to admit of its condensation. I then estimated it quantitatively by precipitation, with a salt of silver, which gave, as the mean of three experiments, a precipitate of cyanuret of silver, of about one grain, which is equal to nearly one-fifth of a grain of anhydrous hydrocyanic acid in one hundred grains of spiritus ætheris nitrici, that being the quantity operated upon.

I endeavoured to produce hydrocyanic acid by the substitution of oil of turpentine, a substance highly rich in carbon, in the place of alcohol, by this process, but did not obtain a trace of the acid. I have since examined the spiritus ætheris nitrici, prepared according to the London Pharmacopœia, but did not succeed in obtaining the slightest indication of the presence of hydrocyanic acid. At present, I have not pursued the investigation far enough to give any satisfactory theory to explain the metamorphosis, which takes place among the elements of the sugar, the alcohol, and the nitric acid, in this process, in the formation of hydrocyanic acid, and I am not aware of any analogous case in Chemistry, by which to account for its production.

2, Lower Brook Street, Grosvenor Square.

Mr. Redwood said, he had never heard of hydrocyanic acid having been detected in the spiritus etheris nitrici in this country, but had been informed that some of the nitrous ether of commerce contained an appreciable quantity of it. The nitrous ether, which was thus contaminated, was prepared from the residual liquor, consisting principally of alcohol and nitric acid, obtained from the manufacturers of fulminating mercury. Some manufacturers of nitrous ether had been obliged to discontinue the use of this liquor, in consequence of the difficulty of entirely getting rid of the hydrocyanic acid which it contained.

ON SODÆ CARBONAS EXSICCATA, AND OTHER DRIED SALTS.

BY MR. INCE.

In the Pharmaceutical Journal of last month, in "Illustrations of the Present State of Pharmacy in England," are some remarks, by Mr. Phillips, on sodæ carbonas exsiccata. It is there stated that in five different specimens he obtained for examination, he found a varying quantity of water, ranging in the following order of per centage, 17, 24, 30, 43, and 52. Without pretending to justify the great difference in these samples, it may be right to remind you, that before the introduction of this preparation into the Pharmacopœia, it was usually prepared by exposing to the air, or hanging up in a dry place in a flannel bag, a certain quantity of what was then called *natron præparatum*, until it effloresced. By this process it was deprived of about 32 per cent. of water, and by a little careful drying, this was reduced to 25 per cent. The resulting compound was a white soluble powder, possessing the advantage of undergoing no further change from efflorescence, and the dose was from five to fifteen grains.

In preparing the sodæ carbonas exsiccata according to the London College formula, you are required, after having dried the carbonate of soda, to heat the powder to redness, to ensure, as Mr. Phillips says, its being anhydrous; in other words, you are to drive off 62 per cent. of water, the composition of crystallized carbonate of soda, being carbonate of soda 37.5, water 62.5, and the symbol Ná "C + 10 H O (Berzelius, &c.). We obtain thus a uniform product; but I hold it as a maxim, that *that* is not always medically convenient which is chemically proper, and this preparation illustrates the position. You have a powder which, on being thrown into water, remains for some time undissolved, especially if care has not been taken, during the ex-

siccation of the salt, to prevent the mass from fusing in the red heat employed. You will all call to mind the vegetables with which it is usually prescribed in the form of powders. A patient seldom waits long to swallow the dose which his own hand has mixed, and it is not unlikely that he may leave a considerable portion of the alkali undissolved at the bottom of the glass. If perchance he takes his prescription to another, who is not so scrupulous in his preparation, a more elegant and agreeable draught is obtained, and the faithful adherent to the College mandate loses his reputation. Deviations from the Pharmacopœia cannot be recommended, but it may be suggested to the College to make some alteration in the formula for this preparation.

As Pharmaceutists, we are occasionally called upon to prepare sulphas sodæ exsiccata, sulphas magnesiæ exsiccata, and other dried neutral salts, which, if care be not taken in their preparation, will be almost insoluble; but it is not the object of this paper to enquire into the cause.

November 1, 1843.

ON THE SOLUBILITY, AND SOME OTHER PROPERTIES, OF SULPHATE OF POTASH.

BY MR. THEOPHILUS REDWOOD.

The recent case of poisoning with sulphate of potash, has caused the attention of medical men and others to be directed to the medicinal effects and chemical properties of this salt. The subject was noticed at the last evening meeting of this Society, and several communications respecting it have appeared in the journals within the last few weeks. The deleterious effects which have sometimes ensued on administering the salt in doses of two drachms or more, have been ascribed, by some persons, to its sparing solubility; by others, to this—in connexion with the angular form of the particles of which it consists, when reduced to powder.

Authors differ materially with regard to the extent of solubility of sulphate of potash in water. According to Turner and Phillips, it requires sixteen parts of water for its solution at 60°; Brande says, sixteen parts of cold water; Murray, seventeen parts of water, at 60°; while Gay Lussac, whose statement appears to be adopted by Graham and Kane, describes it as soluble in nine parts of water, at 60° Fahr.

It was mentioned in this room by Mr. Gallard, at our last meeting, that the solubility of sulphate of potash in water, may be

increased by the addition of a portion of sesquicarbonate of soda —a circumstance which was at the same time ascribed to the formation of new salts in the solution. The correctness of this fact and its explanation has, however, been since denied in a letter, published in the *Medical Gazette*, of October 27th, by Mr. Mowbray, who says, that sulphate of potash is not more soluble in solution of carbonate of soda than in distilled water; he also observes, that "every Chemist will smile when he is informed, that sulphate of potash might be decomposed by carbonate of soda."

The opinions thus expressed are so much at variance, and the experiments by which the questions at issue may be determined, are so simple and easy of execution, that there would be no excuse for our remaining in doubt with regard to them, especially as they are considered to have some bearing upon the safety of the administration of a somewhat popular remedy. Moreover, it is desirable that every Pharmaceutist should be capable of determining points of this description, both for his own satisfaction and for the information of others. I propose, therefore, in giving the result of my experiments, to describe the manner in which they were performed, and to point out the precautions which are necessary, in order to arrive at correct results.

The specimen of sulphate of potash employed in these experiments, was in well-defined crystals, which formed a clear solution in water. This solution was neutral to litmus paper; and on being tested with sulphuretted hydrogen, nitrate of silver, and the usual tests for the presence of nitrates, afforded no indications of impurity.

Exp. 1.—To determine the degree of solubility of this salt, a portion of it was reduced to fine powder, and sixty grains of this was put into a vial, furnished with a good cork. This was now accurately counterpoised in the balance. A pneumatic trough, containing about a gallon of water, at a temperature of 60° Fahr., was provided, and this water was kept constantly at the same temperature. Distilled water was now added to the salt contained in the vial, the solution of which was promoted by agitation, while the temperature was regulated by the immersion of the bottle in the pneumatic trough. When the salt was nearly all dissolved, the further additions of distilled water were made very gradually, and care was taken to preserve the temperature precisely at 60°. The solution being completed, the vial with its contents was weighed, and it was found that 698 grains of water had been added to the salt.

Exp. 2.—A similar quantity (60 grains) of the same specimen of sulphate of potash, was put into another vial, together with thirty grains of sesquicarbonate of soda. The solution of these

salts was effected in the same manner as in the previous case; and it was found that 528 grains only of water was required for the solution.

Exp. 3.—Into another vial was put 60 grains of sulphate of potash and 30 grains of bicarbonate of potash; and, the solution being effected as before, 805 grains of water was found to have been required for that purpose.

Exp. 4.—On dissolving 30 grains of the specimen of sesquicarbonate of soda, used as above, it was found to require 352 grains of water for its solution; and the same quantity of the bicarbonate of potash took 105 grains of water for its solution.

In all these cases, a period of six hours was occupied in effecting the solution.

Thus, then, it appears, that in operating as described above, one part of sulphate of potash requires 11.63 parts of water for its solution at 60°; whereas one part of sulphate of potash, mixed with half its weight of sesquicarbonate of soda, is soluble in 8.74 parts of water at the same temperature. It appears also that whilst the presence of sesquicarbonate of soda increases the solubility of sulphate of potash, a contrary effect is produced by the presence of bicarbonate of potash, the same amount of water being necessary in the latter case, as the two salts would require for their solution separately.

The state of aggregation of sulphate of potash appears to influence its solution very considerably.

Exp. 5.—On adding one part of sulphate of potash in crystals to fourteen parts of water, kept at a temperature of 60°, the solution was not effected in three days, although the vial was frequently agitated; and it was found necessary to add two more parts of water to complete the solution. This fact will probably account for the statement of some Chemists, that sulphate of potash requires sixteen parts of water for its solution.

Exp. 6.—Considerably more sulphate of potash, *in powder*, was added to distilled water, than the latter was capable of dissolving. After keeping the mixture for several hours at 60°, the solution was found to contain one part of salt to 9.5 parts of water. This very nearly accords with Gay-Lussac's statement.

The difference between the results in Exp. 1 and Exp. 6 appears to arise from the fact, that the particles of which the powdered sulphate of potash consists, are not all of equal dimensions. On adding a portion of this powder to water, as in Exp. 1, the smaller particles are first dissolved, and when the solution has nearly attained its point of saturation, the solvent power of the liquid becomes incapable of overcoming the molecular attraction of the remaining particles. This solution, how-

ever, although incapable of dissolving the larger particles, would still take up a farther quantity of the salt in a state of minuter division, as occurs in Exp. 6.

There can be no doubt, I presume, that the increased solubility of sulphate of potash when mixed with sesquicarbonate of soda, arises from the partial decomposition of these two salts, which is quite in accordance with what occurs in many analogous cases. Thus, it has been found, as noticed by Mr. Richard Phillips, that sulphate of barytes may be decomposed by carbonate of potash. Sulphate of strontian is also subject to a similar decomposition.

When two salts, having different acids and bases, are mixed in solution, a partial decomposition of each is frequently effected, so that four salts instead of two will be present. Some Chemists, as Berthollet, have considered that this partition of acids and bases takes place in all cases where salts in solution are mixed; but of this there is no sufficient evidence. Changes of colour and changes of solubility are almost the only means we have of determining the point; so that every fresh observation, with reference to these effects, is so far of importance.

That decompositions are effected in sulphate of potash, as well as in other salts, in opposition to what is conceived to be the prevailing power of affinity, is certain. Thus, on digesting sulphate of potash in nitric acid, with a slight degree of heat, nitrate of potash is obtained; and yet sulphuric acid, under other circumstances, expels nitric acid from its combination with potash. Hydrochloric acid is also capable of decomposing sulphate of potash; and even tartaric acid, if added to a concentrated solution of sulphate of potash, is precipitated in the form of bitartrate of potash. In these cases the decomposition is only partial; so also is that which takes place on adding carbonate of soda to sulphate of potash. In the latter case, sulphate of soda and carbonate of potash are formed to a certain extent; and as sulphate of soda is more soluble than sulphate of potash, the solution of the latter will be promoted by the admixture of carbonate of soda, in proportion to the greater solubility of the newly-formed salts, and to the extent to which double decomposition takes place.

Mr. Waugh was inclined to think that the statement made by Mr. Mowbray was not far from the truth, as far as related to the quantity of sulphate of potash dissolved when carbonate of soda was present, the additional salt which was taken up being, according to Mr. Redwood's explanation, sulphate of soda and not sulphate of potash. It must not therefore be supposed,

that, by adding carbonate of soda, a larger portion of sulphate of potash could be administered in solution in a given quantity of water; and the medical practitioner ought to be aware that he would, under these circumstances, be administering sulphate of soda, the effect of which might be different from that which he anticipated.

Dr. A. T. Thomson thought it of little importance which of the two salts was taken, their effects, as far as his experience enabled him to judge, were nearly similar. The general opinion is, that the sulphate of potassa acts chiefly on the duodenum; the sulphate of soda on the intestinal exhalants; but no means are known of determining, with precision the exact part of the alimentary canal upon which they respectively operate. He regretted not having been present at the last meeting of the Society, when this subject was first introduced, as he should have offered some remarks as to the cause of the poisonous influence of sulphate of potassa. That influence had been ascribed to the insolubility of the salt, and to the mechanical condition of its crystalline particles when in powder: and also to the acid containing arsenious acid. These explanations he believed to be erroneous. Sulphate of potash, like other purgative salts, was considered to act upon the intestinal canal by stimulating the mucous membrane, and to cause a secretion of the intestinal fluid, thus facilitating the dislodgment of the feculent matter. It was evident that an over-dose would produce an excess of irritation, and might set up inflammatory action of a fatal character. His definition of a poison was, a substance which, administered in small quantity, produces deleterious or fatal results; but almost any substance would act injuriously, if taken beyond the proper limit—in other words, when taken in a poisonous dose.

The Chairman thought it a good opportunity to inquire, as several medical men were present, whether it was usual to order sulphate of potash alone, in doses of two or three drachms or more. He had generally seen it given in combination with rhubarb, or some other aperient, and had no recollection of having compounded so large a dose as two drachms.

Mr. Ince had no difficulty in answering the Chairman's question, as he had frequently dispensed private recipes in which two or three drachms of sulphate of potash were ordered alone; and he would have no objection to take that quantity himself.

Mr. Daniel Hanbury coincided with the Chairman, observing that the ordinary dose of sulphate of potash was two or three scruples, and he believed he had never seen so large a dose as two drachms ordered.

ON CERATUM SAPONIS.

BY JOSEPH HOULTON, M.D.
Member of the Royal College of Surgeons.

HAVING observed some months ago a paper or two in the PHARMACEUTICAL JOURNAL, on Emplastrum Cerati Saponis, I presume that a few remarks on the Ceratum Saponis may, with propriety, be submitted to a meeting of the Society. I am in the daily habit of employing the ceratum saponis, but do not find that it is usually kept in that state which answers the intentions for which I desire to use it. I employ it as the external dressing, for which purpose it is admirably adapted by its being sufficiently adhesive to keep the under-dressings *in situ*, and at the same time it is not so likely to irritate the skin as emplastrum resinæ; in fact, its properties are sedative. Now, to answer the purposes for which it is thus intended, it requires to be of a much firmer consistence than a common cerate; yet much that is sold in the shops is soft and very defective in the quality of adhesiveness. I had some from the Hall of this kind, which I have not been able to use. What seems to me a very curious circumstance is, that all the Chemists that I have conversed with on the subject, say that they know of no other kind than that which they respectively keep; that there are two different kinds kept, is a palpable fact, and yet no one seems to be aware of it. Does the difference arise from any variation in the mode of preparation, or in the proportions of the ingredients, or is it, as I have sometimes suspected it might be, from the age of the preparation? Perhaps, when newly made it is soft, and when it has been kept for a certain length of time it becomes hard? I must, in justice to the highly respectable Chemists to whom I have referred, say, that the soft kinds I have seen have not appeared to be defective in any of their proper qualities except their degree of hardness and tenacity. Some surgeons may prefer the *ceratum saponis molle* as an under-dressing; if so, would it not be as well to keep both kinds, the *durum* as well as the *molle*? I have some reason to suspect that this very useful cerate is not at present much employed by surgeons, although it is on many occasions much superior to the spread emplastrum cerati saponis. Perhaps, it is less frequently used now than formerly, from the circumstance of its not being so easily procured.

The Chairman drew the attention of the meeting to some specimens of the hard and also of the soft *ceratum saponis*, which were on the table. He believed the former was more generally kept than Dr. Houlton imagined, under the name of Emplastrum

cerati saponis. The formula adopted at the Army Laboratory had been published in the PHARMACEUTICAL JOURNAL. He had received, from members of the Society, two formulæ, which he read to the meeting, as follows:—

CERATUM SAPONIS DURUM.

Liq. Plumb. Acet. ℔18.
Evaporate to ℔7; then add
Saponis Castil. ℔2.
Ol. Olivæ, ℔4.
Ceræ Flavæ. ℔5.

HARD SOAP CERATE.

Take Black Vinegar, 1 gallon
(The residuum of Common Vinegar after distillation).
Yellow Wax, two pounds eight ounces.
Olive Oil, four pounds.
Castile Soap, two pounds.
Litharge, in powder, four pounds.

Dissolve the soap in the vinegar; then add the litharge, by degrees, and keep it stirring till the vinegar is absorbed. The wax must be dissolved in the oil, then added to the other articles, and boiled to a proper consistence.

Dr. Thomson observed, that the two formulæ were materially different; the former being prepared with liquor plumbi diacetatis, which contained pure acetic acid, while the latter, being made with the residuum of the distillation of vinegar, might be expected to be contaminated to a considerable extent with sulphuric acid, which would occasion the formation of sulphate of lead in the plaster.

Several Members stated, that they were in the habit of keeping the hard soap cerate, or emplastrum cerati saponis, which was identical with that usually spread on linen.

Mr. Davy observed, that, in order to reduce the soap cerate to the consistence of a plaster, nothing was necessary but evaporation.

PROVINCIAL SCHOOLS OF PHARMACY.

AT a recent meeting of the Council, the following Resolutions were passed, together with the instructions which accompany them, relating to the details of the plan upon which it is proposed to establish Branch Schools of the Society:—

"1st. That Country Schools be assisted in such towns or districts as can show to the Council a prospect of effecting this object, according to some satisfactory plan, and that the grants

awarded in each case be equal to one-fourth of the amount of annual subscriptions received from the town or district.

"2d. That in the establishing or assisting of Country Schools, such schools shall be considered as emanating from the parent Society, and shall be designated BRANCH SCHOOLS OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN."

The Council having maturely considered the subject of "PROVINCIAL SCHOOLS OF PHARMACY," have determined to assist, by an annual grant of money, such places as evince a desire to establish and are willing to support them; and that to as full an extent as appears consistent with the general prosperity of the Society, and just to the claims of its country supporters.

It seems desirable, that while the management of such schools should be left to the members resident in the different localities, the Council should exercise a salutary control in determining on the propriety of forming each school, and over the plan on which it is to be conducted. It will, therefore, be necessary that a written application, emanating from a meeting of members, regularly convened, be made to the Council by the Secretary of each town or district, proposing to establish a school; such application to contain a specific statement of the plan, the probable number of pupils that might be expected to attend, and the names of the lecturers to be appointed.

Should this statement be satisfactory to the Council, a grant will be voted according to the principle of the first resolution; and a prospectus of the school must be sent to the Secretary of the Society as soon as published, and also a report at the close of the session.

With respect to the lectures to be delivered, they must be confined to the subjects which the Society considers essential to the education of the Chemist and Druggist—that is to say, Chemistry, Materia Medica, Medical Botany, and Pharmacy; and while care should be taken that the general instruction conveyed has an immediate reference to his peculiar occupation, it is of especial importance in the lastmentioned branch of study, which should certainly be intrusted to a teacher who has a practical knowledge of the subject.

At the commencement it will be wise not to attempt too much, and it will be economical to take advantage of local medical and other scientific institutions for procuring competent teachers, and the use of convenient rooms.

Conscious of the advantages to be derived from the possession of a library, and a collection of Materia Medica, the Council may be disposed to make a small grant for the establishment of such additions to the school; but they deem it right to suggest,

that, in the first instance, it is important to procure a few useful, practical, and elementary works, and that some judicious arrangement be made for affording ready access to them by Members and Associates residing at a considerable distance.

The collection of Materia Medica should be confined to substances little liable to change, and from the external inspection of which students may derive useful information; and as it is to local donations, as well as a judicious use of the Annual Grant, the Provincial Schools must look for an extension of these contingent advantages, it is highly desirable to procure, in places where chemical works are established, specimens in every stage of manufacture, and to take advantage of local facilities for adding to these collections, which, as well as the libraries, are not primarily intended so much for occasional reference, as sources of immediate and permanent instruction.

DONATIONS TO THE LIBRARY AND MUSEUM.

TO THE LIBRARY.

		Presented by
Historia Generalis Plantarum, 2 vols., folio	1586	Dr. Furnivall, (Hertford).
Riolanus's Sure Guide to Physick and Chyrurgery, by Culpeper	1671	Mr. R. Harris, (Crickhowel).
Culpeper's London Dispensatory, containing the Pharmacopœia Londinensis	1679	Mr. R. Harris, (Crickhowel).
Walker's Gatherings from Grave-Yards	1830	G. A. Walker, Esq.
Walker on the Grave-Yards of London	1841	G. A. Walker, Esq.
Walker on Interment and Disinterment	1843	G. A. Walker, Esq.
Three Numbers of the Annales de Thérapeutique		Mr. John Savory.
Williams on the Combustion of Coal and Prevention of Smoke	1841	Henry Dircks, Esq
Lectures on Polarized Light	1843	Dr. Pereira
Tables of Chemical Equivalents, Weights, Measures, &c.	1843	W. T. Brande, Esq.
Maclagan on the Medicinal Qualities of the Bebeeru Bark	1843	Dr. Maclagan, (Edinburgh).
Maclagan on the Bebeeru Tree of British Guiana	1843	Dr. Maclagan, (Edinburgh).
Introductory Lecture delivered at the North London Ophthalmic Institution, by W. W. Cooper, M.R.C.S.	1843	Wm. White Cooper, Esq.

TO THE MUSEUM.

Messrs. H. and C. Schooling.—Specimens of Gelatine (Grenatine) white and coloured.

Messrs. Herring Brothers.—Benares Opium.

Mr. Squire.—Roots of Daphne mezereum and Daphne laureola.

Mr. Wm. Hooper, *Pall Mall East*.—Specimen of Oil of Chamomiles.

Messrs. Langton, Langton, and Wheatley.—Large piece of Gum Acacia (Turkey).

Mr. Bell.—Oil of Cascarilla—Strasburg Turpentine.
Mr. Morson.—Terra Lamna (white)—Ditto ditto (red).
Mr. Keating, *St. Paul's Churchyard.*—Peat from St. Paul's Churchyard.
Mr. Paternoster.—Curious specimen of Indian Rhubarb.
Mr. Jenkin, *Clements Lane.*—Fine specimen of Crystallized alum.
Mr. Cock, *Hatton Garden.*—Specimens of Galena—Native Sulphuret of Copper—Sulphuret of Zinc, Carbonate of Zinc—Oxide of Tin, and Peroxide of Iron.
Professor Guibourt, *Paris.*—Cérosie de la Canne à Sucre—Ecorce de Strychnos pseudo-china de Rio Janeiro—Ladanum.
Edwin Landseer, Esq., R.A., Antlers of the Red Deer and Fallow-Deer.
Mr. Henry Deane, *Clapham*—Large specimen of Moluscite.

ORIGINAL AND EXTRACTED ARTICLES.

ON THE PRESERVATION OF THE "SWEETS" IN CIDER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—In reply to Mr. Williams's inquiry in your last number, I give him the result of my experience in the fermentation of the juice of the apple and pear, so as to preserve as much as possible the luscious property and flavour of the fruit. Some years since it occupied my attention, and I endeavoured in various ways to succeed in so desirable an object, and I gave myself considerable trouble to ascertain the different plans adopted by cider-merchants and others, which I found could not be relied on in producing at all times a rich beverage, however particular they might be — some casks turning out good, others not fit for drinking, consequently were left to run into the acetous fermentation, and sold as vinegar. The usual system is to filter, fine with isinglass, and rack frequently, leaving the bung-hole open until fermentation has ceased. When living in a fruit country, I had placed in my cellar three pipes of cider which had been a day or two previously pressed from the fruit. I added to each cask four ounces of isinglass in solution, and one pound of coarsely-powdered charcoal. I then bunged it down, and introduced a tube through the bung of the shape of a siphon, the contrary end dipping into water for the purpose of excluding the atmospheric air, and at the same time ensuring the safety of the vessel. When it had dropt tolerably fine, I racked it as quickly as possible, adding another quantity of the solution of isinglass and charcoal, stopping it down as before. At the expiration of three weeks, fermentation had ceased. I withdrew the tube and stopped the hole in the bung, and I found I had a bright, rich, and delicious beverage, which continued in the same state until it was drunk. The conclusion, therefore, I come to as necessary to secure Mr. Williams's object,

is to prevent the fermentation exceeding the vinous, to insure which it is necessary to filter and place the cider, immediately it is pressed, in a cool place not subject to variation of temperature, to exclude the atmosphere, and separate the mucilaginous matter as quickly as possible, which I succeeded in by adopting the above plan, and have no doubt it is equally applicable in the manufacturing of British wines.

Your obedient Servant,

W. TWINBERROW.

2, *Edward Street, Portman Square,*
31*st October*, 1843.

Mr. Foster, of Collumpton, has favoured us with a letter on the same subject, in which he states, that "the preservation of the sweets in cider," depends upon the fermentation being stopped precisely at the right time; and observes, that it is a common practice, when this has proceeded rather too far, to rack repeatedly for the purpose of checking it, which plan sometimes succeeds, but not invariably. To save the trouble of racking, some introduce two or three pieces of chalk; others use a powder called *anti-ferment*, which is sold in the shops; others again strain the cider through horse-hair bags sprinkled with charcoal, which methods are sometimes effectual.

ON THE CONSTITUENTS OF CANELLA ALBA.

BY MEYER AND REICHE.

THIS bark contains about eight per cent. of *mannite*, which may be readily separated from the aqueous bitter extract by means of alcohol. Starch and many salts remain undissolved. The ashes of the bark amount to 6 per cent., and contain 86 per cent. of carbonate of lime, 4 per cent. of potash, and 1.2 per cent. of soda, a small portion of magnesia, peroxide of iron, protoxide of manganese, alumina, chlorine, sulphuric and phosphoric acids, and silica. The most interesting constituent is the *volatile oil*, 12 drachms of which were obtained by the distillation of 10lbs of bark. This oil is specifically lighter than water, but a portion of it is observed to sink. If the crude oil be shaken together with a solution of potash, diluted with water and subjected to distillation, a light oil passes over first, and subsequently a heavier one. The *heavy oil* has a peculiar odour, does not enter into combination with potash, and contains 73.7 carbon, 10.7 hydrogen, and 15.6 oxygen. On filtering the solution of potash from which the oil was distilled, neutralizing it with dilute sulphuric acid, and again subjecting it to distillation, a small quantity of the heavy oil passed over, and was readily recognised by the peculiar odour, analogous to that of the oil of cloves. The *light oil*, which constitutes the chief bulk of the volatile oil, resembles the oil of cajeputi in odour. It was distilled in separate portions. The oil which passed over at 356° Fahr., contained 75.25 carbon, 11.28 hydrogen, and 13.46 oxygen. A portion distilled slowly, at 326° Fahr., yielded 79.12—79.09 carbon, 12.58—11.71 hydrogen. Finally, the portion which passed over at last, bore the most striking resemblance to the oil of cajeputi, boiled at 473° Fahr. and had a specific weight=0.941, contained 80.56—80.52 carbon, and 10.66—10.88 hydrogen.—*Annalen der Chemie und Pharmacie*, xlvii. pp. 234—236.

ON THE VOLATILE OIL OF PINUS ABIES. (*Norway Spruce Fir*)

BY GOTTSCHALK.

It is a well-known fact that a forest of Norway spruce fir-trees by no means diffuses the odour of the oil of turpentine, nor has any one yet succeeded in obtaining resin artificially from that oil. The tree contains, perhaps, an oil differing from, but capable of being converted into, the oil of turpentine; it is also probable that the stem of the tree and its root contain different oils. Gottschalk, on Wöhler's suggestion, distilled the young twigs of the *Pinus Abies*, deprived of their leaflets, with water. He obtained a thin colourless oil, which boiled at 320° Fahr., and diffused the odour of the young leaves of the Norway spruce firtree; it became, on exposure to the air, soon resinous, and was not changed on distillation with a moderately strong solution of potash. Distilled with crystallized fused hydrate of potash, it assumed the odour of oil of turpentine, and the potash then contained resin. The rough anhydrous oil consists of 87.07 carbon, and 11.89 hydrogen; a portion distilled separately yielded 87.4 carbon and 11.77 hydrogen. It therefore consists of a large proportion of oil free from oxygen, and of an oil containing but little oxygen. Potassium disengages but little oxygen from it, and then maintains its metallic lustre. A small quantity of a brownish substance is formed. The oil, after this treatment, has a more agreeable odour resembling the oil of lemons or oranges; it is fluid, burns with a bright flame, and has a specific weight =0.850 at 68° Fahr.; it boils at 332°, absorbs much muriatic acid, but does not enter into any solid combination at 32° Fahr., and consists then of 88.38 carbon, and 11.78 hydrogen, like the oil of turpentine.—*Annalen der Chemie und Pharmacie*, xlvii., pp. 237—238.

ON THE COMPOSITION OF THE OIL OF HORSE-RADISH (*Oleum armoraciæ*).

BY CARL HUBATKA.

The root of the horse-radish was cut into thin slices, and distilled several times with water; 100 pounds of the root yielded from five to seven drachms of volatile oil.

When pure, the oil has a specific weight=1.01; and is of pungent odour, resembling the oil of mustard. It acts powerfully as a local irritant, reddening the skin to which it is applied; it is soluble in spirit and ether, but slightly so in water. Chlorine changes the oil into a thick dark mass, with the development of muriatic acid, sulphur, and chlorine. Treated with alcohol, a viscid mass remains with the odour of melted sulphur. Concentrated nitric acid reacts very powerfully on the oil forming nitro-sinapylic resin. Liquid sulphuric acid has a powerful reaction with it, developing sulphurous acid. With ammonia, it forms a white crystalline combination, like the oil of mustard. Digested with fresh oxide of lead, and evaporated in a water-bath, sulphate of lead is obtained, and a substance resembling sinapoline. In odour, specific weight, and reaction, the oil of horse-radish bears so strong a resemblance to the oil of mustard, that analysis could but corroborate their identity.

0.3328 grains of oil of horse-radish gave,

Carbon 0.5858, and water 0.1575.

This would correspond with the composition of the oil of mustard, which is,

		In 100 *parts.*	
Atoms.		Calculated.	Found.
8 Carbon	606.83	48.60	48.41
5 Hydrogen	62.40	5.00	5.26
1 Nitrogen	177.04	14.18	
2 Sulphur	402.33	32.82	
1 Atom of oil of mustard=	1248.60	100.00	

The combination with ammonia yielded on analysis the following results:

First: 0.5923 grains of oil of horse-radish, 0.883 grains carbon, and 0.377 grains water.

Secondly: 0.663 grains of oil of horse-radish, 0.989 grains carbon, and 0.413 grains water.

The combination with ammonia, therefore, corresponds in composition with that of the oil of mustard, and the two oils may be considered as identical. It is singular that man should have selected horse-radish and mustard as condiments, on account of their analogy in taste, as he also thus detected the analogy between tea and coffee.—*Annalen der Chemie und Pharmacie*, xlviii., pp. 153—157.

ON MONESIA.

Dr. G. Martin St. Ange, in an article published in the Paris *Medical Gazette*, in 1839, says:

"A vegetable substance, called *monesia*, has lately been imported from South America, in the form of hard thick cakes, weighing about 500 grammes (8215 grains). These loaves, which are flattened and have paper, of a yellow colour, adhering to them, are composed of the extract prepared in the country from the bark of a tree, whose botanical name is not known. M. Bernard Derosne, the druggist, who introduced it, informs me that some travellers call the monesia bark, *goharem*; and others, *buranhem*. But what is of more importance, is, that the naturalists who have examined it think that the tree which furnishes it is a Chrysophyllum.

"The extract is of a deep brown, and very friable; when broken, it looks like a well-roasted cocoa-nut. It is entirely soluble in water; and its taste, which is at first sugary, like liquorice, soon becomes astringent, and leaves behind a well-marked and lasting acid taste, which is particularly felt in the tonsils.

"The bark of the monesia is smooth and grayish, like that of the plane-tree—with this difference, however, that it is much thicker, that its fracture is imbricated, and that its sweet taste forms a strong contrast with the bitterness of the thin laminæ which are detached from the plane.

"The chemical analysis of the bark of the monesia, and of the imported extract, according to MM. Bernard Derosne and O. Henry, has demonstrated the presence of the following soluble principles: 1, chlorophylle; 2, vegetable wax; 3, a fatty and crystallizable matter; 4, glycyrrhizine; 5, an acid and somewhat bitter substance; 6, a little tannin; 7, an unexamined organic acid; 8, a red colouring matter, resembling that of cinchona; 9, phosphate of lime, with organic acids.

"M. Alquié, professor of internal pathology at the Val-de-Grâce, found:

"1. That of forty-two soldiers attacked with diarrhœa, of different degrees of severity, thirty-six were cured in twelve days; twenty-four of these by the extract of monesia, given in pills, in doses of from fourteen to eighteen grains a day; and twelve by the tincture, administered as a clyster with bran-water.

"2. That in two cases of menorrhagia, the extract and the tincture of monesia, given internally, soon calmed the pain, and stopped the uterine discharge.

"3. That in four women attacked with profuse leucorrhœa, the extract of monesia, given internally, and the diluted tincture injected into the vagina, were beneficial.

"4. That in two cases of hæmoptysis, where bleeding, ligature of the limbs, and ordinary astringents had been employed without advantage, the extract of monesia succeeded completely; and that several chronic cases of bronchorrhœa were benefited by the syrup of monesia, which was sometimes combined with opium."

THE ELAÏOMETER.

(An Instrument for detecting the adulteration of Olive Oil.)

BY M. GOBLEY.

The price of olive oil is sufficiently high to lead to its admixture with cheaper oils. The oil of poppy-seeds is that which is usually employed for this adulteration, as it has the advantages of being cheap, of having a sweet taste, and very little smell.

Several methods have been proposed for detecting this fraud. Messrs. Soubeiran and Blondeau, who tried all the different processes for this purpose, found that the method founded on the difference in the degrees of viscosity in olive oil and oil of poppy-seeds, and the method of Poutet, afford the most certain indications as to the purity of olive oil.

The first of these processes consists, as is known, in putting the suspected oil into a bottle, and introducing bubbles of air into the oil by shaking the bottle. When the olive oil is pure, the bubbles disappear as they rise to the surface of the liquid ; whereas they continue for some time if the oil be mixed with oil of poppy-seeds. But this method can only be applied in cases where at least a tenth part of poppy oil has been added.

Poutet's process consists in mixing the oil with a twelfth of its weight of a solution of mercury, made in the proportion of six parts of mercury to seven and-a-half parts of nitric acid, sp. gr. 1.35 ; the solution of the mercury is allowed to take place spontaneously, and is then used immediately. The mixture should be shaken every ten minutes during a period of two hours ; it is then to be put into a cold cellar, and in twenty-four hours afterwards its consistence is to be observed. Messrs. Soubeiran and Blondeau recommend, in estimating the consistence of the solidified oil, to strike its surface with a glass rod ; and they apply the term *sonorously firm* to oil which becomes sufficiently solidified to afford a manifest sound, on percussion ; they also apply the terms *firm*, *rather firm*, having *the consistence of suet*, *a soft consistence*, *the consistence of congealed oil*, to those samples of oil which acquire a consistence more or less solid.

By neither of these methods is it possible to determine with certainty the presence of poppy oil in oil of olives, unless the sample contain at least one-tenth of the former.

Of these two processes, that of Poutet is undoubtedly the best ; and yet this, according to the above-named Chemists, is in many respects deficient. Thus, not only does it fail to determine the proportions in which the two oils may be mixed, but it offers the great inconvenience of requiring the employment of a reagent immediately after it has been prepared, of occupying a considerable length of time, and of requiring a certain expertness of manipulation ; for the solution of the mercury in nitric acid, resulting from the spontaneous action of these two bodies, is not so uniform in its composition as to ensure always the same effect. This reagent sometimes fails to produce the expected effect, and it is remarkable that when this takes place, the solution does not crystallize after standing for a day. Messrs. Soubeiran and Blondeau recommend that no account should be taken of the experiments, if the remainder of the solution which has not been used, is found not to have crystallized ; and in all cases to repeat the process so as to guard against errors.

My process is performed in a very much shorter time than that of Poutet; it usually occupies only a quarter-of-an-hour. It affords indications of the smallest quantity of oil of poppy seeds when mixed with olive oil, and of the proportions in which these two are present.

This process consists in the use of an instrument which I have called the *claïometer*, the construction of which is founded on the difference between the densities of olive oil and oil of poppies. This instrument is an *areometer*,

having a large bulb surmounted by a very small tube. In consequence of this construction, the instrument is one of extreme sensibility. It is graduated, so that at a temperature of 10° Reaumer, or 12.5 C. (55° Fahr.), it rises to 0 in pure oil of poppy-seeds, this being the greatest density indicated; and to 50 in pure olive oil, this being the least density indicated. The interval between 0 and 50 is divided into fifty equal parts. The 0 is marked at the bottom of the stem, and the 50 at the top.

I have graduated the instrument at a temperature of 55° Fahr., because this is the usual temperature of the cellars in which the oil is kept.

If, on immersing the instrument at 55° Fahr., the stem sinks to the point marked 50, it may be inferred that the oil is pure; but if, on the other hand, it does not reach this point, the inference will be that the oil is mixed.

If the instrument stands at 40, this number multiplied by two, will give the quantity of pure olive oil present in 100 parts ; the sample, in this case, being mixed with twenty per cent of oil of poppy-seeds. In like manner, any other number below 50, at which the instrument floats, will, by the same process, indicate the amount of adulteration.—*Journal de Pharmacie.*

OLIVE OIL.

There are four different kinds of olive oil, known in the districts where it is prepared: 1, the *virgin* oil; 2, the *ordinary* oil (*huile ordinaire*); 3, oil of *the infernal regions* (*huile d'enfer*); 4, oil prepared by *fermentation.*

1. *Virgin oil.*—In the district Montpellier, they apply the term *virgin oil* to that which spontaneously separates from the paste of crushed olives. This oil is not met with in commerce, being all used by the inhabitants of the district, either as an emollient remedy, or for oiling the works of watches.

In the district of Aix, they give the name *virgin oil* to that which is first obtained from the olives ground to a paste in a mill, and submitted to a slight pressure two or three days after collecting the fruit. Thus, there is no virgin oil brought from Montpellier but a good deal of it is brought from Aix.

2. *Ordinary oil.*—In the district of Montpellier, this oil is prepared by pressing the olives, previously crushed and mixed with boiling water. At Aix, the *ordinary oil* is made from the olives which have been used for obtaining the *virgin oil.* The paste, which has been previously pressed, is broken up, a certain quantity of boiling water is poured over it, and it is then again submitted to the press. By this second expression, in which more pressure is applied than in the previous one, an oil is obtained somewhat inferior in quality to the *virgin oil.* The oil is separated from the water in a few hours after the operation.

3. *Oil of the infernal regions* (*huile d'enfer*).—The water which has been employed in the preceding operation, is, in some districts, conducted into large reservoirs, called the *infernal regions*, where it is left for many days. During this period, any oil that might have remained mixed with the water separates, and collects on the surface. This oil, being very inferior in quality, is only fit for burning in lamps, for which it answers very well. It is sometimes called *lamp-oil.*

4. *Fermented oil* (*huile fermentée*).—This is obtained, in the two above-named districts, by leaving the fresh olives in heaps for some time, and pouring boiling water over them before pressing the oil. But this method is very seldom put in practice, for the olives, during this fermentation, lose their peculiar flavour, become much heated, and acquire a musty taste, which is communicated to the oil.

The fruity flavour of the oil depends upon the quality of the olives from

which it has been pressed, and not upon the method adopted in its preparation.

There are met with in commerce, the virgin olive oil of Aix—the ordinary oil of Montpellier and Aix—rarely, the oil obtained by fermentation—and never, the oil of the infernal regions.—*Journal de Pharmacie.*

FLUID EXTRACT OF SENNA, PREPARED IN VACUO.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—We regret to intrude on your notice a matter of comparatively private interest; yet, though such be its character, we feel satisfied that your sense of justice, and desire to maintain your repute as an impartial journalist, will induce you to give a place to the following explanatory remarks regarding the preparation of the Fluid Extract of Senna *in vacuo*, twice adverted to in your pages by Dr. Christison, the distinguished professor of Materia Medica in the Edinburgh University.

In your number for November, an extract from a letter of Dr. Christison is given, of which the following sentences form the commencement :—

"I should wish it to be more distinctly understood, that the process for the fluid extract of senna was devised by Mr. Duncan, and communicated by him to me, with permission to make it known. It is right also for me to add, that a similar preparation was introduced here about the same time, by Messrs. Smith, in Duke Street."

The impression which this must leave on the mind of every reader unacquainted with the facts, is, that Mr. Duncan "devised" or struck out the first idea of the fluid extract of senna, and that the Messrs. Smith, if they did not precisely follow in his wake, at least only thought of the preparation about the same time. The case, Sir, stands very differently. The Messrs. Smith had invented, and prepared the fluid extract of senna for many months previously to the manufacture of any similar article by Mr. Duncan, and they are able to prove this by a simple reference to dates. They called the attention of the medical profession and the public to their preparation, by means of advertisements in the *Edinburgh Courant* and *North British Advertiser*, in July, 1841, and they also find, that in the account between themselves and Mr. Duncan for 1841, the fluid extract of senna forms one of the items, its growing popularity, apparently, having led his customers to call for it at his place of business. Is it going too far, then, when we find Mr. Duncan's fluid preparation of senna to have been first offered to the public, by advertisement, in February 1842—a period of seven months after our own had been introduced—to assume that he had taken the idea from us, and that the favour bestowed on our fluid extract had induced him to think of manufacturing for his own use a similar article?

This matter, as was already admitted, is one chiefly of private interest; but yet any subject with which Professor Christison connects his name, acquires some degree of public importance, and we think it hard, that, by some seemingly inadvertent expressions from his pen, we should be deprived of the credit to which we deem ourselves justly entitled, of having been the first to prepare and introduce the fluid extract of senna. As we believe the majority of the public and the profession to have hitherto preferred our own preparation, we deem the last sentence of Dr. Christison's letter to contain a high compliment to ourselves : "The fluid extract of senna is now used very largely in this city, and by many medical practitioners, as well as myself, almost to the exclusion of every other preparation. I have no doubt it is the best form, in every respect, which has yet been proposed."

Professor Christison says, that our fluid extract differs from that of Mr. Duncan in being seasoned with aromatics, and he doubts if aromatics be "a useful addition." Passing over the fact that aromatics are almost invariably recommended in connection with the use of liquid preparations of senna, by all the colleges of Europe, we beg to say, that the difference between our own preparation and that of Mr. Duncan rests on much more essential points than the use of aromatics. We know that we stand at a disadvantage in so far as we have not published our recipe, but it must be remembered that we sought no controversy on this subject, but have been led to make this public appeal in self-defence.

We are, Sir,

Your most obedient and humble Servants,

T. AND H. SMITH.

REVIEW.

CHEMISTRY, *in its Application to Agriculture and Physiology.* By JUSTUS LIEBIG, M.D., PH. D., F.R.S., M.R.I.A., Professor of Chemistry in the University of Giessen, &c. &c. &c. *Third Edition, revised and enlarged. Edited from the manuscript of the Author by* LYON PLAYFAIR, PH.D., F.G.S., Honorary Member of, and Consulting Chemist to the Royal Agricultural Society of Scotland. *London: Taylor and Walton*, 1843.

FAMILIAR LETTERS ON CHEMISTRY, *and its Relation to Commerce, Physiology, and Agriculture.* By JUSTUS LIEBIG, &c. Edited by JOHN GARDINER, M.D., Member of the Chemical Society. *London: Taylor and Walton*, 1843.

THE Saxon race are now resuming the ascendancy in Chemistry which it held for many hundred years, through a regular succession of cultivators of nature, and ingenious improvers of the useful arts; such as Albertus Magnus, of Cologne and Ratisbon, and Isaac Hollandus, in the thirteenth century; Basil Valentine, of Erfurt, the author of antimonial preparations; Paracelsus, of Zurich, the inventor of mercurial medicines; Van Helmont, of Brussels; Agricola, Glaser, Erkern, Glauber, Otto, Guericke; Kunkel, the discoverer of phosphorus; Beccher, of Frankfurt; Stahl, of Berlin, called the sublime; Boerhaave, Margraaff, Pott; Diesbach, to whom the world is indebted for Prussian blue; Klaproth; to which list of the older Chemists Bergmann and Scheele may be added, as of a cognate stock of people; both of which, in the present age, fully maintain their hereditary glory in the temple of corpuscular science.

Berzelius, in a short introduction to his Jahres-Bericht, for 1839, says, "To Germany's learned men we must acknowledge that we are more indebted than to those of any other country, for their exertions in the twin sciences of Physics and Chemistry. While the true spirit of the German naturalists prevails, will

the '*cui bono*?' never withhold any one from an object of research, or cause him any solicitude, even should he be able to derive no material (personal) advantage from it." Each of the numerous states in Germany, of moderate political importance, has a school of Chemistry, and each government studies to cherish it by appointing professors solely on the score of merit, and rewards their zeal and genius by civic honours and rewards—well aware how essential a thorough knowledge of this science is to the study of nature, and the cultivation of all the useful as well as liberal arts. No corresponding public distinctions or recompence have been assigned to the most eminent of the British Chemists, even to the unrivalled Davy, whose invaluable safety-lamp, though, like that of Aladdin, it conducted its owner unhurt amidst the most dangerous of subterranean genii or gnomes, was unlike in this respect, that it conjured up no gold or gems from our Treasury lords. The consequence is, that Germany has the merit of having made at least three-fourths of all the recent discoveries in Chemistry, and this chiefly in its most difficult and interesting domain, the Chemistry of life, vegetable and animal. It maintains, of course, a great many excellent journals, rich vehicles of these scientific investigations, while our United Kingdom hardly produces sufficient new research to support one with vigour. Moreover, each of the German schools trains up a succession of Philosophical Chemists, by a system of discipline hardly known in this country, where the pupil is set to work out a problem more or less intricate by himself; a system very different from the fugel-man practice of some of our practical courses, in which all the students perform, at the word of command, some pre-explained experiment, not unlike recruits learning the manual and platoon exercise from a drill-serjeant. Aided by young Chemists, taught under his judicious instructions, Professor Liebig has, within a few years, brought forth a surprising multitude of new facts, not merely in pure Chemistry, but in its applications to agriculture, physiology, and the arts.

The first work at the head of this article is well known, and has already excited a considerable sensation in the thinking world. Many of the views which it unfolds, both in agriculture and physiology, have met with equally zealous partizans and opponents. Some of his strictures on the physiologists and agriculturists, were deemed satirical by several of his countrymen, and called forth some rather severe animadversions. These passages appear to be softened down and modified into a less objectionable form in the present edition of the book. A detailed review of it would be unsuitable to the pages of this journal; and, therefore, a general notice of its contents, and of a few of its more prominent doctrines, may suffice. We may state, at the

outset, that it seems to be well translated, which is more than we can say for the English editions of some other German works. Among the measures recently adopted by the Professor to improve the work, he refers to a journey through the agricultural districts of England and Scotland; and to a long series of experiments carried on in his public laboratory, with the sole object of giving a firmer basis to his exposition of the causes of the advantageous results attending the practice of the rotation of crops.

Subserviently to physiology, he has subjected the process of nutrition of the animal organism to a stricter investigation, and he feels himself, in consequence, in a situation to give a simple and determinate expression to his view of the origin of animal excrements, and to the cause of their beneficial effects on the growth of vegetables. Hence, he says, further progress in agriculture from Chemisty is not to be doubted.

He dedicates the volume to the British Association in a courteous strain; and, indeed, it is manifest from the enumeration of his British honorary titles and the suppression of his French ones, that he is solicitous to stand well with the people of this country, in return for the well-merited civilities received from them in his visits to us.

The first part is distributed into thirteen chapters, treating of most important topics—the constituents of plants; the origin and assimilation of carbon; the origin and action of humus; the assimilation of hydrogen; the assimilation of nitrogen; the source of sulphur; on the inorganic constituents of plants; on the formation of arable land; the art of culture; on fallow; on the rotation of crops; on manure; retrospective view of the preceding theories. There are some supplementary chapters: on the sources of ammonia; is nitric acid a food for plants? does the nitrogen of the air take part in vegetation? and giant sea-weed; with a short appendix.

The second part discusses the processes of fermentation, decay, and putrefaction, in fourteen chapters—where are examined, Chemical transformations; the causes of fermentation, decay, and putrefaction; fermentation and putrefaction; transformation of bodies containing, and of those not containing, nitrogen; fermentation of sugar and of yeast; exemacausis or decay; of acetic acid; nitrification; vinous fermentation; of beer; fermentation with fungi and infusoria; decay of woody fibre; vegetable mould; mouldering of paper and coal; on poisons, contagions and miasms; with an appendix.

In the sixth chapter of the first part, on the Source of Sulphur, we find some topics which cannot fail to interest our Pharmaceutical readers.

All the animal tissues, muscle, cellular membrane, the organic substance of bone, hair, skin, &c., are formed from the blood, and this vital fluid is derived by animals from plants. Now sulphur is contained in the fibrine, albumine, and caseine, of blood; and by its presence distinguishes them from all the other component parts of the animal body. The element sulphur itself is present, as also in the albumen of an egg, and not one of its oxidized compounds. Whence do animals derive this substance? Modern discovery has proved that in plants there exist quantities of compounds containing sulphur, but always accompanied with nitrogen. We find sulphur in corn, in peas, and other leguminous plants. The juices of all plants contain another compound of sulphur. It is remarkable that the sulphur compound dissolved in the juice of plants, is identical with the albumen contained in the serum of the blood, and in the white of an egg; that the sulphur contained in the seeds of corn, possesses the same properties and composition as the fibrine of blood; and that the nutritious constituents of peas, beans, and lentils, is actually of the same nature and composition as the caseine (the cheesy curd) of milk. Hence it follows, that plants, and not animals, generate the constituents of blood containing sulphur. When these are wanting in the food of an animal, its blood cannot be formed; and hence vegetable food will be nutritious according to the quantity of these ingredients contained in it. But the cruciform plants contain peculiar sulphur compounds much richer in that element than the vegetable constituents of blood. The seeds of black mustard, horse-radish, garlic, onions, and scurvy-grass, are particularly marked in this respect. From all these plants we obtain, by simple distillation with water, certain volatile oils, different from other organic compounds not containing sulphur, by their peculiar pungent and disagreeable odour.

It is obvious, that if the compound containing sulphur be either wholly absent or deficient in quantity in the soil, the vegetable constituents containing sulphur will either be not formed, or only in proportion to the quantity of the above compound. As far as our knowledge extends, soils receive their sulphur from the sulphates dissolved in the water absorbed by their roots from the soil. Sulphate of ammonia is, of all compounds containing sulphur, the one most fitted for the assimilation of that element; as it contains also the nitrogen equally necessary for the support of vegetable life, and equally a component of fibrine, albumine, and caseine. But sulphate of ammonia may also be regarded as a compound of water with equal equivalents of sulphur and nitrogen.

Thus, by the mere removal of the elements of water from this

compound, its sulphur and nitrogen might be enabled to pass over into the composition of plants.

The components of plants are so arranged that one equivalent of sulphur exists for every twenty-five equivalents of nitrogen. Hence much more ammonia must be offered to plants than that contained in sulphate of ammonia, if all the sulphur of this salt is to become a constituent of the above-mentioned organic ingredients. This bears a complete analogy to the assimilation of the carbon and nitrogen given to plants by the carbonate of ammonia contained in rain and dew. Hence it is necessary that the carbon of six equivalents of carbonic acid be taken up at the same time, and enter into combination with the nitrogen, in order to produce the principal nitrogenous compounds, which contain one equivalent of nitrogen to eight equivalents of carbon. The passage of sulphur, derived from a sulphate, into the composition of vegetable matter, necessarily indicates that the sulphate has been exposed to the action of the same causes as those by which the decomposition of carbonic acid was effected in the plant; and that the sulphuric acid has been decomposed into sulphur and oxygen; the former of which is assimilated, while the latter is evolved in a gaseous form, to supply the atmosphere with the *pabulum vitæ*. Should the sulphuric acid be presented in the state of sulphate of potash or soda, the bases of these salts will be set at liberty after the decomposition of their acid. Now, these bases are actually found in all plants, united to either organic acids, or to the vegetable compounds containing sulphur. The vegetable casein of peas, beans, and other leguminous plants, is, by itself, insoluble in water, but is very soluble in the form in which it occurs in plants, on account of the presence of alkaline matter. Thus, also, the albumen in the juices of plants is combined with an alkali, and vegetable fibrine must have been dissolved by alkalis before it could be soluble, and become secreted and fixed in the seeds of the *cerealia*, as wheat, oats, barley, rye, &c. Gypsum (sulphate of lime) is the most generally diffused sulphate; and common salt is always present in soils. Now these two salts, in their mutual reaction, may give birth to sulphate of soda and chloride of calcium. In order to form the vegetable compound that contains sulphur, this element, with its alkaline solvent, must be retained by the plant, while the chloride of calcium goes off by the roots. Now we know that a like process goes on in marine plants; the soda or potash is derived from the chlorides of sodium or potassium, which are decomposed through the agency of the sulphate of lime or magnesia.

A similar process takes place with the cereal and other plants destitute of lime; and thus may be explained the use of common salt as a manure, in enabling the plant, for which this manure is

appropriate, to extract from the soil the sulphur present in sulphate of lime.

These views of the Professor, which are equally new, ingenious, and profound, may be appreciated by every student of Pharmaceutical Chemistry. They give hope of a clearer insight into the hitherto mysterious regions of vegetable and animal life, and of guiding the farmer to a judicious selection, mixture, and application of manures. The constitution also of those proximate principles which are most influential and essential to animal beings, will tend to throw great light upon their processes of assimilation and nutrition, while the important functions performed by sulphur in the composition of the blood, will excite peculiar interest in the investigation of the nature and operation of many valuable articles of the Materia Medica hitherto little regarded and less understood.

When plants are fully developed, they can live upon carbonic acid, water. and ammonia; but, in the embryo state, they must be fed with the starch, sugar, and gum, accompanied by azotized matter, as stored up for them in the cotyledons. The growth of a fœtus, and the incubation of an egg, proceed in a totally different manner from the nutrition of an animal separated from its parent; for the fœtus lives without air, but the independent animal cannot. Pure water is best for a young plant, water containing carbonic acid for one a month old.

Phosphate of lime, so essential a nutriment of all plants as well as animals, is insoluble in pure water; but it is soluble in water containing common salt or a salt of ammonia; and in water containing sulphate of ammonia, it dissolves as readily as gypsum. Phosphate of lime, like the carbonate, is also soluble in carbonated water. Phosphate of lime, through the channel of plants, is thus introduced into our bodies. Hence we see what a valuable manure fresh guano must be, as it contains, combined with much uric acid, abundance of phosphate of lime and of ammoniacal phosphates and carbonates.

Were it possible to form the organic constituents of blood, existing in plants, without the aid of the inorganic ingredients of the blood, such as potash, soda, phosphates of soda and lime, they would be of very little use to animals, and could not fulfil the purposes for which they were destined by the wisdom of the Creator. Blood, milk, and muscular fibre cannot be formed without the aid of alkalies and of phosphates; and bones, as everybody knows, cannot be produced without phosphate of lime.

The substances most prone to fermentation and putrefaction, all contain nitrogen, which is the most indifferent of all elements, evincing no decided attraction to any one of the simple bodies;

a character which it preserves in all its compounds, and which explains why it is so easily separated from all its combinations. The hydrated cyanic acid, one of the simplest of all the compounds of nitrogen, is perhaps the best adapted to convey a distinct idea of the manner in which the atoms are disposed in transformations. This acid contains carbon, hydrogen, and oxygen in such proportions, that the addition of a certain quantity of the elements of water, is sufficient exactly to cause the oxygen contained in the water and acid to unite with the carbon and form carbonic acid, and the hydrogen of the water and of the acid to combine with the nitrogen and form ammonia. The most favourable conditions for a complete metamorphosis are therefore associated in these bodies, and it is well known that the disunion takes place on the instant in which the cyanic acid and water are brought into contact; the mixture being converted into carbonic acid and ammonia with brisk effervescence. This process may be considered as the type of the transformations of all the azotized compounds; it is putrefaction in its most simple and perfect form, because the new compounds, carbonic acid and ammonia, are incapable of further change. Cyanogen, a compound of carbon and nitrogen, passes spontaneously by the agency of water through a series of eight successive transformations:—1st, a blackish insoluble matter is deposited from the aqueous solution; 2d, cyanic acid is formed; 3d, at the same time hydrocyanic acid; 4th, oxalic acid; and, 5th, ammonia, producing oxalate of ammonia; 6th, urea or anomalous cyanate of ammonia, from the union of cyanic acid with the newly-generated ammonia; 7th, a brown matter, containing hydrogen and cyanogen; and, 8th, formic acid, whence, with the ammonia present, formate of ammonia. Thus a substance, consisting only of two elements, carbon and nitrogen, yields, in contact with water, eight totally different products! What a fertile field is here laid open to scientific research and speculation! and what light may not hence be derived in its further exploration, not only to fermentation and putrefaction, but to many other processes of organic nature!! The peculiar decomposition of sugar in brewing beer or wine, exhibits a type of all the metamorphoses designated fermentation; but the same sugar which, in contact with yeast, yields alcohol and carbonic acid, gives rise, when in contact with putrefying cheese, to butyric acid, hydrogen being at the same time liberated. The juices of parsnips, beet-roots, and onions (which contain azote), when mixed with yeast, ferment, affording carbonic acid and alcohol at the expense of the sugar they contain; but when exposed alone, to spontaneous fermentation, at a temperature of about 100° Fahr., they evolve offensive-smelling gases, and, instead of the above products, they afford

lactic acid, manna, and something like gum arabic, bodies which together weigh more than the sugar employed. This transformation may be regarded as a type of putrefaction. When a solution of gypsum in water is mixed with a decoction of bran, and left to become putrid in close vessels, remarkable changes ensue; for the sulphuric acid disappears, and gives place to carbonic acid and sulphuretted hydrogen, which divide the lime of the gypsum between them. Hence we readily see how sulphur may be educed for the uses of vegetation.

The matters subject to *eremacausis* may be divided into two classes, according as the substances which unite with the oxygen of the air, evolve, or do not evolve, carbonic acid. When the volatile oil of bitter almonds is exposed to the air, it absorbs two equivalents of oxygen, and is converted into benzoic acid; but one-half of the oxygen absorbed combines with the hydrogen of the oil, and forms water, which remains in union with the anhydrous benzoic acid. But the absorption of oxygen by drying oils does not depend upon the oxidation of their carbon; for in raw walnut-oil, for example, which was not free from mucilage and other substances, only twenty-one volumes of carbonic acid were evolved for every 146 volumes of oxygen absorbed; whereas each volume of oxygen corresponds and can give birth to a volume of carbonic acid. When wood putrefies in marshes, carbon and oxygen are separated from its elements in the form of carbonic acid, and hydrogen in the form of sulphuretted hydrogen. But when wood decays or putrefies in the air, its hydrogen does not combine with carbon but with oxygen, for which it has a much greater affinity at common temperatures.

All putrefying bodies suffer eremacausis (slow combustion), when exposed freely to the air; and all such bodies run into putrefaction when air is excluded. All bodies, likewise, in the former state, induce slow decay in other bodies, just as putrefying bodies do. Hence animal food of every kind, and even the most delicate vegetables, may be preserved unchanged, if heated to the temperature of boiling water, in vessels from which the air is completely excluded. Food thus prepared has been kept good for years in the British Navy. When moist azotized animal matter is exposed to the action of air, ammonia is constantly liberated; but nitric acid is never formed, except when alkalies or alkaline earths are present, which determine the formation of nitrates, with other products of oxidation.

The spirit obtained from corn and potatoes contains an offensive and unwholesome ethereal oil of a similar composition in both, derived from their cellular tissue; but spirit made from potato-starch saccharified by dilute sulphuric acid, is derived completely free from the potato oil; and in like manner beer made from

such *saccharum*, with a small proportion of good barley-malt, is more wholesome and grateful than beer made from malt alone. English, French, and most of the German beers are converted into vinegar when exposed to the action of the air; but from this bad property Bavarian beer is exempt, for it may be kept in vessels only half filled without becoming sour, and swallowed without generating acid in weak stomachs. This valuable quality is obtained for it by a peculiar management of the fermentation of the wort; affording, in the right cultivation of experimental science, which the highly-salaried conductors of our gigantic London breweries neglect, the solution of one of the most beautiful problems of the theory of fermentation. The Bavarian brewer operates this beneficial change upon his worts rather by *erema-causis* than by the common process of tumultuous fermentation.

A great many chemical compounds can destroy the vital functions of individual organs; and when their action is sufficiently intense, can occasion the death of animals; an effect remarkably exemplified in the exceedingly small quantities of arsenic acid and corrosive sublimate which, when absorbed into the system, may prove fatal to the exercise of its functions. Hydrated peroxide of iron is an invaluable antidote to the poison of arsenic, and white of egg to corrosive sublimate, when placed in contact with them in the stomach and *primæ viæ*, but quite ineffective when they have passed into the circulating system. It is a well-known fact, that when blood, cerebral substance, gall, pus, and such like substances, in a putrid state, have been laid upon fresh wounds of animals, vomiting, debility, and death have supervened. Bodies in dissecting-rooms pass into a state of decomposition capable of imparting itself to the living body, and through a scratch of a bone, or the anatomist's scalpel, of producing fatal disease. The poison of bad sausages belongs to this head. In Wurtembürg, where sausages are prepared from heterogeneous materials, such as blood, liver, brains, milk, meal and bread, with salt and spices, such evil results are by no means uncommon. Death caused by such sausages, is preceded by the gradual wasting of the muscular fibre, and of all the constituents of the body similarly composed; so that the patient becomes emaciated, dries into a complete mummy, and soon after dies. The *cadaver* is stiff, as if frozen, and is not subject to putrefaction. During the progress of the disease, the saliva becomes viscid, and emits an offensive smell. No peculiar poison can be detected in the sausages, and they are rendered fit for animals to eat safely by the action of alcohol, and by boiling water, which destroy the noxious property, without acquiring it themselves. These act by destroying the putrefactive condition of the sausages. When the putrescent sausages pass

through the stomach into the circulating system, they impart their peculiar action to the constituents of the blood, operating as a peculiar ferment. Poisons of this kind are generated by the body itself in particular diseases. In small-pox, plague, and syphilis, substances of a peculiar nature are generated from the constituents of the blood.

These matters are capable of inducing in the blood of a healthy individual a decomposition similar to that of which they themselves are the subjects; in other words, they produce the same disease. The morbid virus appears to reproduce itself, just as seeds produce seeds. The temperature at which water boils, and contact with alcohol, render all such poisons inert. Acids, salts of mercury, sulphurous acid, chlorine, iodine, bromine, aromatic substances, volatile oils, particularly the empyreumatic, smoke, and a decoction of coffee, completely destroy their contagious properties, combining with, or otherwise decomposing them. Now all these agents, without exception, retard fermentation, putrefaction, and *eremacausis;* and when present in sufficient quantity, completely arrest these processes of decomposition. It is a fact very decisive of their chemical nature and mode of action, that those poisons which are neutral or alkaline, such as the poisonous matter of the contagious fever in cattle (*typhus contagiosus ruminantium*) or that of the small-pox, lose their whole power of contagion in the stomach; whilst that of sausages, which has an acid reaction, retains all its frightful properties under the same circumstances. In the former of these cases, the free acid present in the stomach destroys the action of the poison, because it is opposed in chemical properties; while in the latter, it strengthens, or at any rate opposes no impediment to its poisonous action.

The action of the virus of cow-pox on the human body is analogous to that of the *bottom* yeast (*unterhefe*) upon wort in the fermentation of Bavarian beer; it communicates its own state of decomposition to a matter in the blood, and from a second matter is itself regenerated, but by a totally different mode of decomposition; the product possesses the mild form and all the properties of the lymph of cow-pox. The susceptibility of infection by the virus of human small-pox, must cease after vaccination, because the substance to which this susceptibility is owing has been removed from the body by a peculiar process of decomposition, artificially excited. But this substance may be again generated in the same individual, so that he may again become liable to contagion; and a second or third vaccination will again remove the peculiar substance from the system.

All observations hitherto made upon gaseous contagious matters, or *miasmata*, prove that they are substances in a state of

decomposition, whose virulence is increased by ammonia, which in general is their diffusive agent. This volatile alkaline matter is generally produced in cases of disease; it is always emitted in those where contagion is generated, and is well known to be an invariable product of the decomposition of animal matter. It is therefore a most unfit companion in a sick-room. In fact, the presence of ammonia in the air of chambers in which contagious patients lie, may be readily detected, for the moisture there condensed on the outsides of vessels containing ice, will render reddened litmus paper blue, and cause a white precipitate in solution of corrosive sublimate. The ammoniacal salts, also obtained by the evaporation of faintly acidulated rain-water, when mixed with lime, emit a rank ammoniacal odour resembling that of putrid corpses or dunghills. By allowing volatile acids to exhale in an atmosphere impregnated with gaseous contagions, the ammonia to which they owe their diffusiveness is neutralized, and thus they lose their power of causing the chemical change which constitutes contagion. In this view muriatic, nitric, and acetic acids are preferable antiloimics to chlorine, which acts so injuriously on the lungs. Sulphuretted and phosphuretted hydrogen, very deleterious products of putrefaction, are best counteracted by the fumes of burning sulphur, and the vapours of nitric acid. For carbonic acid gas, milk of lime is the appropriate absorbent.

Such are a few of the instructive views laid open by the professor of Giessen. They deserve the serious consideration not only of chemists, physiologists, and agriculturists, but of every thinking man: and will, no doubt, give rise to much future investigation. When the general spirit is so truly philosophical, it would be unbecoming to cavil at little errors and omissions, which will undoubtedly be corrected and supplied in a future edition of this very interesting work.

On the second publication, the title of which is placed at the head of this article, little need be said. It is rather a slighter work than the science of Liebig should have dictated even in moments of *delassement*, and has somewhat the air of being written *at* the British public; or at least, in a style more obsequious than is usual in philosophy. Its outer form is epistolatory, but its tenor exhibits no trace of letter-writing, except in its desultory discursiveness, setting out from caoutchouc, cork, platinum, lapis lazuli, in his first epistle; rambling to the condensation of gases in the second; to the manufacture of soda, glass, soap, sulphuric acid, and our sulphur-trade dispute with Naples, in the third, and so forth. Yet we freely admit that this little book sparkles in every page with the genius of its author, but the light is reflected from

so many *facettes* of his polygonal Chemistry, as to be calculated as much to dazzle as to edify his readers. From sulphur he leaps off to magnetism in his fourth letter, and here we find a curious speculation upon "the relation of coals and zinc as economic sources of force," which he handles most summarily by stating, from Despretz, merely the relative heat evolved in burning coals and zinc, which is said to be as six to one; numbers, in fact, nearly in the inverse ratio of the atomic weights of these two bodies—though by no means of the proportion of oxygen which they respectively consume in burning. which is nearly as ten to one; for three parts of carbon, in forming carbonic acid, take eight of oxygen, while thirty-two of zinc are required for the same purpose. We therefore consider the Professor's lucubrations on this subject to be slight and unsatisfactory; in fact, he dismisses electro-magnetic action as cavalierly here as he does the globular structure of yeast in the preceding larger work, where he contents himself with saying, "the idea that yeast reproduces itself, as seeds reproduce seeds, cannot for a moment be entertained." But, surely, the microscopic observations of Schulze, Schwann, Cagniard de la Tour, Turpin, Quevenne, and many others, as to the organized nature of yeast, merited a more detailed notice, and a more satisfactory refutation.

After describing, from Quevenne, the spheroids, studded with certain black points, and of determinate dimensions, Dumas concludes, that "The microscopic aspect of yeast (*ferment*) is therefore very favourable to the idea formed of its being a body adapted to reproduce itself, in the manner of grafting (*par voie de bourgeonnement*)."* We are well aware of the feud which prevails between the German and the French professors; but we think that the former might have shown a little more courtesy in the refutation of opinions espoused by many respectable naturalists.

From the galvanic pile our letter-writer bounces away to beet-root sugar; and shows, justly enough, that notwithstanding the triumph here achieved by Chemistry, the business is one of ill-directed capital and industry. He next demonstrates that if the valley of the Rhine possessed mines of diamonds as rich as those of Golconda, Visiapoor, or the Brazils, they would probably not be worth the working, on account of the cost of labour. We are immediately told that it would be unprofitable to have gas-light in London if coke and other products of the distillation of coal could not be made use of. We shall leave this new problem to be solved by the gas engineers, along with his suggestion about "condensing coal-gas into a white, dry, solid, odourless substance, portable, and capable of being placed upon a candlestick,

* *Traité de Chimie Appliquée*, vi. 325.

and burned in a lamp!" This may be called a grace beyond the reach of the Chemist's magic art, which looks like the inspiration of tobacco-smoke, so thickly diffused in the atmosphere of Giessen.

The fifth letter is devoted to isomerism, as exemplified in the constitution of the well-known essential oils, and of the little-known bodies, cyanuric acid, hydrated cyanic acid, and cyamelide, aldehyde, metaldehyde and eltaldehyde—which, to the person familiarly addressed as "*My dear Sir,*" at the head of each letter, will probably appear a mystification of a clear enough subject. From ismorphism, he suddenly pounces at the end of this rambling epistle upon Mr. Brown, of Edinburgh, candidate for the Chemical chair in the University, who—

"Thought he had converted iron into rhodium, and carbon or paracyanogen into silicon. His paper upon this subject was published in the *Transactions of the Royal Society of Edinburgh*, and contained internal evidence, without a repetition of his experiments, that he was totally unacquainted with the principles of chemical analysis. But his experiments have been carefully repeated by qualified persons, and they have completely proved his ignorance; *his* rhodium is iron and *his* silicon an impure incombustible coal.*"

The sixth letter upon respiration begins his view of the alliance of Chemistry with Physiology, which is continued down to the eleventh letter, where Agriculture makes its appearance. Here the farmer, whether practical or theoretical, will find much to interest and instruct him. But, alas! in England—

"The elements of the soil indispensable to plants, do not return to the fields; contrivances resulting from the manners and customs of the English people, *and peculiar to them*, render it difficult, perhaps impossible, to collect the enormous quantity of the phosphates which are daily, as solid and liquid excrements, carried into the rivers."

These wasteful contrivances peculiar to Englishmen, are sad eyesores to our German farmer-general. English travellers in Germany see no such waste in that country, but may have the economy of agriculture illustrated as potently by the nose as by any other sense, and that not in dirty lanes, but in the magnificent hotels upon the banks of the Rhine, as well as in the remoter provinces. Their scientific adviser should contrive some mode of catching the ammonia which is so abominably wasted in these palaces during the summer months.

Our letter-writer descants very justly upon the necessity of the phosphates as manures, in the form of bone-dust and guano, to the successful cultivation of wheat and other cereals, and says, justly,

"We are thus brought to the further indisputable conclusion, that no seed suitable to become food for man and animals, can be formed in any

* *Familiar Letters*, page 55.

plant without the presence and co-operation of the phosphates. A field in which phosphate of lime, or the alkaline phosphates, form no part of the soil, is totally incapable of producing grain, peas, or beans.

"We believe," adds he, "that the importation of one hundred-weight of *guano*, is equivalent to the importation of eight hundred-weight of wheat—the hundred-weight of guano assumes, in a time which can be accurately estimated, the form of a quantity of food, corresponding to eight hundred-weight of wheat. It cannot be disputed that the annual expense of Great Britain for the importation of bones and guano, is equivalent to a duty on corn, with this difference only, that the amount is paid to foreigners in money."

We grant the burthen of double taxation to be a very grievous evil and oppression, but with respect to the guano being paid for in money, the Professor's political economy is at fault; for Peru and Bolivia, in return for that raw article, make vast importations of British manufactures. But it seems to our Professor that England is very foolish to send away so much hard cash for that of which she possesses inexhaustible stores in the *coprolithes* (literally *dung-stones*) first described by our able geologist, Dr. Buckland, in the cave of Kirkdale, and the limestone formations near Clifton, as the petrified excrements of extinct animals and gigantic saurian reptiles, and analyzed by Dr. Wollaston as well as other Chemists, by whom they have been found to contain from $9\frac{1}{2}$ to 83 per cent. of phosphate of lime, with more or less carbonate of lime, and a little ammonia, phosphate of magnesia, &c. The coprolithe of Clifton is said to contain 18 per cent. of phosphate of lime. The amount and value of these curious petrifactions seems to be much magnified by Professor Liebig; and, in fact, his whole account of the coprolithes has very much the air of a puff, *ad captandum*, introduced to give popularity to his little book.

ELEMENTARY INSTRUCTION IN CHEMICAL ANALYSIS. By DR. C. REMIGIUS FRESENIUS, *Chemical Assistant in the Laboratory of the University of Giessen. With a Preface by* Professor LIEBIG. Edited by J. LLOYD BULLOCK.

THE simplicity of the arrangement of this work, its elementary character, and the clear manner in which every process is described, recommend it as a useful introduction to the study of Chemical Analysis. It commences by briefly explaining the nature of the operations most frequently employed in analytical investigations, such as solution, crystallization, precipitation, &c., it enumerates the apparatus and utensils required in these operations; it gives the methods of preparing the reagents to be employed, and describes the relations which these bear with the various substances to which they are applied as tests. This forms the first part of the work. The second part consists of instructions as to the systematic method of proceeding in the examination of a substance, the composition of which is not known.

"A definite method," the author says, "must form the basis of every

analytical investigation. But it is not by any means necessary that this method should be in all cases one and the same. Practice, reflection, and a due attention to circumstances, will, on the contrary, in most cases, direct us to various and different methods. But all analytical methods agree in this, that the substances existing, or supposed to exist, must first be divided into certain groups, and the bodies belonging to these groups be further distinguished from each other, so as at last to admit of their individual detection. The diversity of analytical methods depends partly on the order in which reagents are applied, and partly on their selection.

"Before we can venture upon inventing methods of our own for individual cases, we must first make ourselves thoroughly conversant with a certain definite course or system of chemical analysis in general. This system must have passed through the ordeal of experience, and must be adapted to every case imaginable, so as to enable us afterwards, when we have acquired some practice in analysis to determine which modification of the general method will, in certain given cases, most easily and rapidly lead to the attainment of the object in view.

"The exposition of such a systematic course, tested by experience, and combining the greatest possible simplicity, with the greatest possible security, is the object of the second part of this work."

Dr. Fresenius's book, however, treats only of *qualitative analysis*, and although this is necessarily the first department of chemical analysis to which the student should direct his attention, yet it must not be forgotten that there is another equally extensive and no less important department, namely, *quantitative analysis*, the knowledge and application of which constitute the ultimate aim of analytical investigation.

TABLES OF CHEMICAL EQUIVALENTS, WEIGHTS, MEASURES, &c. By W. T. BRANDE. *Published by J. W. Parker, West Strand.*

THESE tables consist of the symbols, atomic weights, and densities of the simple substances; the symbols and chemical equivalents of bases, salts, and acids, and of organic compounds; the corresponding degrees of the three thermometrical scales—Centigrade, Fahrenheit, Reaumur; the specific gravities corresponding with the degrees of Baumé's hydrometer; the quantities of sulphuric, nitric, and hydrochloric acids; of absolute alcohol, of ammonia, potash, and soda, in the mixtures of these substances with water, at different densities, &c. They are printed on five sheets, adapted for hanging in frames, and will be found exceedingly useful to the Chemist, for reference on points connected with the composition and strength of many Pharmaceutical compounds.

A SERIES OF TABLES *of the Elementary and Compound Bodies, systematically arranged, and adapted as Tables of Equivalents or as* CHEMICAL LABELS. By CHARLES BUTTON and WARREN DE LA RUE.

THE first part only of these tables has yet been published, containing simple bodies, oxides, chlorides, iodides, bromides,

fluorides, sulphurets, phosphurets, seleniurets, tellurets, arsenurets, carburets, and the compounds of ammonium. They contain the names of the chemical bodies comprehended under these heads, arranged alphabetically; each name being enclosed between lines in the form of a label, and having, in addition to the name, its chemical symbol and equivalent number. The equivalents are given according to Liebig, Brande, and Berzelius, and are calculated with reference to hydrogen as unity. These tables will be found useful for reference as to the composition of the bodies described, and especially so as labels for these substances. The price will not be an obstacle to their use in either of these ways, especially to the scientific Chemist, by whom alone the greater part of the compounds are kept or known. Labels of this description have for some time past been used in the Museum of the Pharmaceutical Society.

The Literary and Scientific Register and Almanack for 1844. By J. W. G. Gutch, M.R.C.S.E. *London: E. Lumley, 56, Chancery Lane; and Simpkin and Marshall, Stationers' Court.*

We have already given favourable notices of Mr. Gutch's Pocket-Book, for 1842 and 1843. We have only to add, in reference to the one for the ensuing year, that it is an improvement upon its predecessors. It is, in fact, the most useful and instructive pocket-book we have seen.

THE SALE OF SPIRITS OF WINE.

We have received a letter from Mr. Redfern, of Ashby-de-la-Zouch, on the subject of an observation which we made in our number for August, founded upon two Acts of Parliament, viz., 9 Geo. II., cap. 22, sec. 12, and 16 Geo. II., cap. 8, sec. 12. We then hazarded the opinion, which had been sanctioned by a legal adviser, that every penalty which had been inflicted for the sale of spirits of wine in less quantities than a pint, to be consumed or used off the premises, has been a violation of the above acts.

Mr. Redfern observes, that this statement is calculated to mislead our readers, and requires some explanation.

On a further examination of all the Acts of Parliament on the subject, we have discovered that the clause which gave us the power to sell the article in less quantities than a pint, although not specifically abrogated, is virtually annulled by two clauses in subsequent Acts of Parliament. The 17th Geo. II., cap. 17,

sec. 19, enacts, that, under a penalty of ten pounds, spirits of wine may not be sold without a licence to be drunk or consumed on the premises in less quantities than two gallons, or sent abroad in less quantities than two gallons.

30 Geo. III., cap. 38, sec. 15, declares all to be *retailers* who shall sell, offer, or expose for sale less than two gallons.

The 6th Geo. IV., cap. 81, sec. 26, alters and defines the amount of the penalty in the following terms:

"6 GEO. IV., CAP. 81, SEC. 26.—And be it further enacted, That if any person or persons shall make, or manufacture, deal in, retail, or sell any goods or commodities hereinafter mentioned, or shall exercise or carry on any trade or business hereinafter mentioned, for the making or manufacturing, or dealing in, retailing, or selling of which goods or commodities, or for the exercising or carrying on of which trade or business, a licence is required by this act, without taking out such licence as is in that behalf required, he, she, or they shall, for every such offence, respectively forfeit and lose the respective penalty thereupon imposed, as hereinafter follows: (that is to say),

"Every distiller, or maker of low wines or spirits, and every rectifier or compounder of spirits so offending respectively, shall respectively forfeit and lose five hundred pounds.

"Every manufacturer of tobacco or snuff so offending, shall forfeit and lose two hundred pounds.

"Every person exercising or carrying on the trade or business of an auctioneer, or selling any goods or chattels, lands, tenements, or hereditaments by auction;—every brewer of table-beer only, for sale;—every brewer of beer (other than table-beer only) for sale;—every brewer of beer for sale, who shall retain such beer to be consumed elsewhere than on his, her, or their premises;—every person, not being a brewer of beer, who shall sell strong-beer only in casks, containing not less than four gallons and a half, or in not less than two dozen reputed quart-bottles at one time, to be drunk or consumed elsewhere, than on his her or their premises;—every maker of wax or spermaceti candles, for sale;—every chandler or maker of candles for sale, other than wax or spermaceti candles;—every glass-maker, every tanner, every tawer;—every dresser of hides or skins in oil;—every currier;—every maker of vellum or parchment;—every maltster, or maker of malt;—every maker of paper, pasteboard, or scaleboard—every printer, painter, or stainer of paper;—every calico-printer, and every printer, painter, or stainer of linens, cottons, stuffs, or silks;—every maker of soap for sale;—every dealer in spirits, not being a retailer thereof;—every retailer of spirits in Ireland, being licensed to trade in, vend, and sell coffee, tea, cocoa-nuts, chocolate, or pepper;—every starch-maker for sale;—every maker of sweets or made wines, or of mead or metheglin, for sale;—every maker of vinegar, or acetous acid, for sale; every dealer in foreign wine;—and every wire-drawer, or other person, who shall draw, or cause to be drawn, any gilt or silver wire, commonly called big wire, so offending respectively, shall respectively forfeit and lose the sum of one hundred pounds.

"Every person who shall sell beer, cider, or perry, by retail, to be drunk or consumed in his, her, or their house or premises;—every retailer of spirits, not being a retailer of spirits in Ireland, duly licensed to sell coffee, tea, cocoa-nuts, chocolate, or pepper;—every retailer of foreign wine;—every retailer of sweets or made wines, or of mead or metheglin;—every person trading in or selling coffee, tea, cocoa-nuts, chocolate, or pepper;—every dealer in or seller of tobacco or snuff;—every maker of stills in Scotland or Ireland;—every person in Scotland or Ireland, not being a

distiller, rectifier, or compounder of spirits, who shall keep or use any still for the carrying on the trade of a Chemist, or any other trade or business requiring the use of any still or stills so offending respectively, shall respectively forfeit and lose the sum of fifty pounds."

Having been informed that one of our members had recently obtained from the magistrates, at the quarter sessions, a licence to sell spirits of wine, and being desirous of ascertaining the general interpretation of the Act adopted by the Board of Excise, in reference to this point, the Editor applied to the Board (in his individual capacity) for a licence.

The answer sent by Mr. Freeling, by authority of the Board, simply stated, that the Act of 16th Geo. II., cap. 8, sec. 12, exempts from the operations of the Spirit Licence Act, "Physicians, Apothecaries, Surgeons, or Chemists, as to any spirits or spirituous liquors which they may use in the preparation or making up of medicines." A second letter was therefore sent to the Board, requesting the favour of the interpretation of the above Act, in reference to the sale of Spirits of Wine, when required as such, in a pure state, for medical purposes. From the words of the "GENERAL ORDER," lately issued by the Board of Excise, and quoted in our last number, page 265, it might be inferred that *pure* or *unmedicated* Spirit of Wine could not legally be *sold* without a licence, even for medicinal purposes; and also that, if *impure* or *medicated*, it might be sold without reserve. Inquiry was also made on these points, as well as with reference to the licence required for the sale of VINEGAR and PEPPER.

The following answer has been received:

"EXCISE OFFICE.
21*st November*, 1843.

"SIR,

"THE Commissioners having had under consideration your further application, to be informed whether spirits of wine may be sold in the pure state by Chemists for medical purposes, if disguised and sold as medicated spirits of wine.

"I am directed to refer you to my letter of the 31st ultimo, quoting the law under which the persons referred to are alone allowed to sell spirits used in the preparation of medicines, and to acquaint you that the Board are not aware of any other law under which Chemists can sell spirits, and that the said law does not authorize a sale by Chemists of spirits of wine in a pure state, or colourably medicated: they however, are not prohibited from obtaining a magistrate's certificate, and the Excise licences to sell beer and spirits by retail, granted thereon, under the Act of 6th Geo. IV. c. 31, s. 13.

"With reference to your letter of the 4th instant, I am directed to acquaint you that no Excise licence is requisite for the sale of VINEGAR, provided the seller does not manufacture or make it, but that the sale of PEPPER does require a licence, under 6th Geo. IV. c. 81, s. 2.

"I am, Sir,
"Your obedient Servant,
"J. CLAYTON FREELING.

"JACOB BELL, ESQ."

TO CORRESPONDENTS.

W. C. (Bath) animadverts upon the inaccuracy of many of the graduated glass measures and small weights, which are supplied by the manufacturers, and suggests that some means ought to be adopted by the Society for providing the Members with such as are correct.

A. P. S. (Pontefract) has written on the same subject, and encloses a table, showing the inaccuracy in seventeen sets of grain-weights, which he has carefully examined; of the half-grains only four were correct, the others varying from $\frac{7}{16}$ to $\frac{5}{8}$; of the one-grains, several weighed $\frac{7}{8}$, others $1\frac{1}{8}$ and one $1\frac{1}{2}$. The other weights were equally defective, nearly two-thirds of the whole being incorrect.

[We are aware that it is very difficult to obtain accurate weights and measures, although the law is severe on this subject. The visitation of shops for the purpose of examining weights and measures, and destroying such as are incorrect, applies principally to those which are used in retail business: but we have heard that several Chemists in London have lately had some of their grain-weights seized on account of their not being legally stamped. The attention of Chemists having been directed to this subject, we hope the manufacturers will be more careful when they find that the weights and measures are generally tested by those who purchase them].

Δ thinks that if Mr. Phillips would extend his illustrations to the sources from whence retail Chemists obtain their stock, he would probably exonerate the latter from some of the blame which he at present attaches to them; and states, that he has bought tinctura ferri sesquichloridi, sp. ætheris nitrici, and other articles, which, on examination, proved to be very different from the Pharmacopœia preparations. [We may observe, that it is the duty of every Chemist either to make his preparations himself or to ascertain that those which he purchases are correctly and honestly prepared. In those cases in which accuracy can be tested by chemical means, these should not be neglected; in other cases, the character of the party furnishing the articles is the only security, and it is important not to afford any pretext for sending such as are of inferior quality by refusing to pay what would be a fair price for the best.]

"Amator Scientiæ" (!!!) writes for a recipe for curling cream for the hair and crystallized pommade; and several other Correspondents require formulæ for similar articles of the toilet, such as Circassian cream, hair-dye, &c. [We must confess our inability to give information on these subjects.]

T. T. inquires, What is the composition of the glaciarium? [We have heard that it is fused sulphate of soda.]

A. P. S. (Edinburgh).—Cantharides may be preserved in a bottle by means of a few drops of *strong* acetic acid.

A. P. S. (Exeter).—For information respecting the solubility of lead in water conveyed through pipes of that metal, see vol. ii., pp. 355 and 406. Water is not injured, as a beverage, by passing through iron-pipes, unless some acid be present. Water containing sulphate of lime in solution is injurious in some cases, but this involves a medical question. The quantity of saline matter contained in water may be easily ascertained by evaporation.

An Associate.—See vol. ii., page 530.

R. L. (Sherborne).—The preparation is Pilula Hydrarg. Chloridi Comp.

A. P. S. (Pimlico) inquires, by what process Oil of Turpentine can be deprived of its smell? and mentions that a dyer at Hackney sells it in this state at 4*s.* per gallon. [Our Correspondent must be labouring under some error: we can give no information on this point.]

"Juvenis."—We have never succeeded in entirely depriving neat's-foot oil of its odour.

"X., AN ASSOCIATE."—Fish-oils are generally purified by means of sulphuric acid, &c. We know of no "simple method" of depriving them of smell.

E. W. M. states, that in making biniodide of mercury, on rubbing the iodine and mercury together in a mortar without the spirits of wine, "a deflagration took place, and iodine vapour was disengaged." The addition of the spirit is intended to prevent this result.

"JUVENIS" enquires, whether ammonio-chloride of mercury is formed in the following mixture? ℞ Hydr. Bichlor. gr. ij. — Ammon. Mur. gr. ij. — Liq. Potass. ℥ij.—Liq. Ammon. ℥j.—Aquæ ad ℨj. Misce. [Yes.]

A. P. S. (Sherborne).—(1.) Genuine oil of rhodium is procured from rhodium wood: a spurious article is sometimes imported. (2.) The deposit which takes place in essence of lemons, is probably occasioned by the presence of some mucilaginous matter, as it does not occur in the distilled essence. (3.) The galvanic apparatus alluded to, may be obtained of most dealers in such instruments.

"ALPHA."—We presume the addition of oxalic acid to the French polish, in the case mentioned, is intended to prevent the darkening of the wood.

Mr. LEAY, and M. P. S. (Cheltenham).—We intend to give explicit details of the process for making a cobalt colour, in our next number.

Θ—We can add nothing to our answer of last month, but that when OPIUM is ordered, the opium of commerce, usually called crude opium, should be used.

"A COUNTRY MEMBER."—(1.) ℞ Hydrarg., ℨviij.(Av.)—Acid. Nit. fℨxiv. (Sp. g. 1.43.) Solve et adde, Adipis, ℔ iij. (Av.)—Ol. Olivæ, ℔ ij. (Av.)

(2.) As a general rule the sp. gr. of Syrups should be 1.26 to 1.28.

(3.) Answer in our next.

(4.) For the Liquor Morphiæ Acetatis, see vol i., p. 470.

T. A. M. (Reading).—(1.) Platinum balls, for eudiometrical purposes, are prepared with a mixture of spongy platinum, pipe-clay, and a solution of sal-ammoniac. When dry, they are to be ignited by the blow-pipe flame, by which the sal-ammoniac is expelled, and the balls left porous. We have understood that the balls for lamps are made by compressing spongy platinum in a wire net, enveloped in a metal mould. The disintegrated balls mentioned by our Correspondent, should be moistened with a solution of sal-ammoniac, the mass made into balls, which are to be dried and ignited. (2.) Sulphate of copper is largely obtained at the Royal Mint in the refining of gold and silver. (See Professor Brande's letter to Dr. Percira in the *Elements of Materia Medica*, 2d edition, p. 777). Being a secondary product it is sold at a very low rate. Sulphate of copper of commerce is frequently contaminated with iron, and we have been informed, that it is admixed with alum. Caustic potash will precipitate the oxides of copper and iron, but, when used in excess, will dissolve alumina; and in the alkaline solution our correspondent may detect alumina, provided alum be the adulterating ingredient. (3.) The mode of making hydriodic acid is described in every elementary work on Chemistry, and in the *Pharmaceutical Journal*, vol. iii., p. 111. (4.) Aloëtic acid—see Kane's *Elements of Chemistry*, p. 1148, also Pereira's *Materia Medica*, pp., 972 and 973. (5.) See *Pharmaceutical Journal*, vol. ii, p. 92. Two equivalents of chromic acid, 2 ($Cr O^3$) evolve three equivalents of oxygen, O_3, and leave one equivalent of the green or sesquioxide of chromium, $Cr_2 O^3$. By deflagration with nitre, or by fusion with chlorate of potash, this oxide is oxidized to its maximum, and reconverted into chromic acid.

"INQUISITOR."—To reduce acetic acid, of which 100 grains saturate 96 grains of carbonate of soda, to such a strength that 100 grains will saturate 87 grains. 96 : 100 :: 87 : 90.6. Therefore 90.6 of the acid diluted with 9.4 of water will be of the strength required.

A.P.S. (Goole).—A mixture of oil of bitter almonds with four or five times the quantity of spirit, is sold as "Almond Flavour."

"Esculapius" (Manchester).—(1.) See vol. i. page 399.—(2.) See the Pharmacopœia.—(3.) Compound tincture of cardamoms sometimes deposits its colouring matter, but the cause of this deposition is not clearly understood.

"A Member" (Dudley).—An infusion of red cabbage with sulphuric acid may be used for making a blood-red show-colour.

G. N. suggests that a recognised formula for Black-draught would be a valuable addition to the Pharmacopœia.

"Dum Spiro Spero."—(1.) The Pharmacopœia alluded to is, we presume, Dr. Collier's translation of the Pharmacopœia of the London College: although not published "by authority," it is a useful work.—(2.) Dr. Thomson's London Dispensary.—(3.) Graham's Chemistry.—(4.) Pereira's Materia Medica.

Mr. Ashton (Alford), in reference to an enquiry of a Correspondent last month, reminds us that a filtering machine is sold by Messrs. Maw, of Aldersgate Street, called "The New Galenical Vacuum Filter," which he has used for some years with success.

"Spero."—(1.) We believe no such work exists.—(2.) No.

A. Z,—Griffin's Chemical Manipulation.

"An Apprentice" (Windsor) should send his name.

A. G.—We should think that any pupil desiring a certificate of attendance at the Lectures might obtain it on application.

"Quis"—See vol. ii., No. 8. ℥iss.—See vol. iii., No. 4, p. 191.

B. H. (Newcastle).—See vol. i., No. 6, p. 264.

"A Member" (Tonbridge). "An Associate" (London).—See vol. ii., page 535. We cannot give formulæ for patent medicines, having no means of obtaining authentic information.

"Codex" has favoured us with a very extraordinary Price List. If this is to be taken as a specimen of charges, we beg to remind our Members of the necessity of contributing largely to the Benevolent Fund.

"Castigator" reproaches us severely for the remarks in our last number on the "curious specimens of shop bills," observing, that if the term "Genuine Chemist" denote a person, whose business is restricted to dispensing and the sale of drugs, there are comparatively few in this country who could by this means obtain a living. He considers it is not our province "to hold up to contempt any member of the trade;" and contends that the manufactures of vinegar, ink, and blacking are scientific processes, not derogatory to the Chemist. [In all the remarks which we make on subjects of this nature, we are particularly careful to avoid personal allusions—our arguments being directed against practices, and not against individuals. We are aware that it is impossible in some localities to obtain a subsistence by the practice of pure Pharmacy (see vol. ii., page 3); but while we admit the plea of necessity as a justification, under some circumstances, for carrying on a mixed business, this affords no excuse for the kind of traffic evidenced by these remarkable documents. We consider that it is our province to offer any suggestions which may appear calculated to improve the condition and elevate the professional character of the Pharmaceutical Chemist.

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. VII.—JANUARY 1st, 1844.

ON THE USE AND ABUSE OF CERTIFICATES OF MERIT.

The propriety of granting certificates or diplomas to persons possessing a certain amount of qualification, in any particular profession or pursuit, has been so generally acknowledged that it is seldom if ever called in question. This kind of distinction operates on those who are rising to eminence, as an incentive to exertion, and constitutes one of the rewards enjoyed by the industrious. But in order that the system may have its full effect, care should be taken to prevent the abuses which may arise, either from granting certificates to improper persons, or from their being appropriated to improper purposes, when deservedly acquired. This, it must be admitted, is at all times difficult, and especially so at the commencement of any institution in which such certificates are granted.

We allude to the subject for the purpose of answering certain objections which have been raised against the Certificate of Membership, or Diploma, of the Pharmaceutical Society, which objections, although they appear to possess some weight when superficially considered, are founded upon an imperfect acquaintance with the facts of the case.

We have already, in a former number,* pointed out the circumstances under which the diploma of the Pharmaceutical Society was issued, the nature of that document, and the claims of the original Members to some distinction which should identify

* Vol. ii, No. 4, page 173.

them with the measures of improvement now in progress by their instrumentality. We think that if these circumstances and facts were duly considered, the propriety of the course which has been adopted would no longer be doubted; and we regret that a continuance of the animadversions obliges us once more to revert to a subject which we shall now dismiss in a summary manner.

In answer to those who assert that all the Members of the Society ought to have been compelled to undergo an examination, and that only those who passed this ordeal should have received a diploma, we may observe, first, that this is a chimerical notion—the object could not have been attained, and the attempt would have resulted in an entire failure of the undertaking. It is not likely that men who had been engaged in business for a series of years, from which they were in receipt of a regular income, would have incurred the risk of losing their standing by submitting to be examined by Professors of the first rank in science, and to stake their future subsistence on the result. Nor is it likely that they would have submitted to be examined by persons of the same standing with themselves, who, being a self-constituted board, had no claim to exercise this function. If membership had been offered only on these terms, it would have been very generally, if not universally declined, and *no society could have been formed.* Secondly, *if* the members of the trade, as a body, had been so fully qualified in their profession as to be able to pass a rigid examination—*if* they had been so completely distinguished from unqualified persons, and so united among themselves, as to constitute, without any further improvement or education, a mass of philosophers entitled to the dignity of a profession, and the honour of a scientific diploma, then *there would have been no necessity for any society.*

The necessity of a society arose from the fact, that the Chemists were not united, organized, and sufficiently educated. It was necessary that this Society should consist of Chemists and Druggists. If, therefore, the present generation had been excluded because they stood in need of improvement, the next generation

would have been no better, because no improved system could have been introduced. We contend, that in the absence of an Act of Parliament, no means could have been devised of attaining the desired object, but the voluntary union of the existing race of Chemists in the manner in which it has been effected; and that this union could not have taken place if the original members had been stigmatized by exclusion from the rank to which they feel that they are entitled, and from the honour of a certificate, which, after all, merely denotes their adhesion to a recognised and scientific society.

Those who are at all acquainted with human nature must have observed how difficult it is to obtain general support, advice, and assistance in an arduous and responsible undertaking; and how frequently it happens, that when a considerable advance has been made, those who, in the first instance, refused to co-operate, very kindly condescend to point out how much better it might have been done.

The past history of the Chemists and Druggists of this country affords abundant evidence of the extreme difficulty of effecting a salutary and permanent union among them*; the progress of the Pharmaceutical Society up to the present time demonstrates the fact, that the plan at present in operation is the most successful which has been attempted. To those who object that our regulations, as well as the members of our body, are not yet perfect, we reply, that an approach to perfection is only to be attained by unwearied perseverance, and a modification of measures to existing circumstances; and not by the endeavour, which must inevitably be fruitless, to erect at once a system so perfect in itself as to exclude from within its pale the persons for whose benefit and improvement it is designed.

It has been stated, in several of the Medical journals, that the diploma of the Pharmaceutical Society has been appropriated by some of the Members to improper uses—that it has been exhi-

* See Historical Sketch, pp. 32, 39, 53, 56, 64, 73, &c.

bited and appealed to as a test of qualification to *practise medicine* —and that the public has thus been imposed upon by an incorrect representation of the nature and value of the certificate. On account of this alleged misconduct on the part of some individuals, reflections have been cast upon the Society, and the whole plan of its constitution has been denounced as a means of "arming the ignorant with additional power to do mischief." The injustice of this allegation is so manifest, that it scarcely deserves any notice, since the delinquency, if proved, involves a violation of the principles, laws, constitution, and object of the Institution; in fact, those Members who wish well to the cause in which we are engaged, namely, the improvement and elevation of our profession, would, we feel assured, readily concur in any expressions of censure which might be put forth in reference to the abuses alluded to, provided this censure was directed against the parties implicated, instead of being unjustly levelled against the Society, whose laws are at variance with such conduct.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

On the 22d of November, a LECTURE was delivered by EDWIN J. QUEKETT, F.L.S.,

ON THE RELATION EXISTING BETWEEN THE STRUCTURE OF THE ORGANS OF PLANTS, AND CERTAIN VEGETABLE PRODUCTS,

Of which the following is an abstract:

AFTER having described the several organs belonging to a plant, and the tissues of which they were composed, the various productions of the vegetable kingdom were classified, not according to the views of Raspail or De Candolle, as certain objections were offered against the methods of those two authors.

To the former it was considered incorrect in combining such substances as *volatile oils*, *fixed oils*, *resinous matters*, *milks*, and *wax*. There was no evidence to prove that *essential oils* or *resinous matters* ever contribute towards the materials out of which the several tissues are formed, being, it was considered, like milks, the only true secretions, and having always a distinct set of organs for their elaboration. On the other hand, it was maintained, that *fixed oils* did contribute much toward the materials that serve to build up the young plant; for their presence in such quantity, always in the seed (with one exception), could scarcely be supposed to be required if not for supplying some of the substances, for aiding the embryo in its first effort of development, until roots were produced so that nourishment could be extracted from the soil. In the cocoa-nut it was shown that the cells were full of a concrete oil, and in germination a large process of the cotyledon of the embryo grows into the interior of the seed, absorbing this matter from the cells, the "milk" within supplying the fluid to the young plant, until the roots and the young stem have extended themselves so as to protrude through the thick fibrous coating of the fruit.

There were sundry objections offered, also, against the substances considered as *secretions* and *excretions* in the classification of De Candolle, who, like Raspail, does not arrange *fixed oils* among nutritious matters, and omits to consider *chlorophylle* as an organized substance, and having certain relations with amylaceous products, both in development and function in the vegetable. For these and certain other reasons, a new classification was proposed after the following manner:—

- Nutritious
  - Organized
    - Fecula
    - Chlorophylle
  - Not Organized
    - Gum
    - Sugar
    - Fat Oils
- Not Nutritious
  - Secretions
    - Volatile Oils
    - Milks
  - Excretions
    - Resinous Matters
    - Certain Saccharine Matters
    - Wax
  - Cellular Deposits
    - Soluble
      - Acids
      - Alkalies
      - Neutral principles
    - Insoluble
      - Raphides
  - Structural Deposits
    - Mineral
      - Silica
      - Lime, &c.
    - Vegetable
      - Colouring Matter, &c.

In noticing the first division of the nutritious productions of plants, viz., *the organized*, it was remarked, that it may appear singular the elevating a substance hitherto considered but colouring matter, to the rank of one among the most important in the vegetable.

It can, however, be shown that *chlorophylle* is organized, each granule being a cell containing a greenish matter, which turns brown under the influence of iodine, showing its gummy nature; and it can also be shown that it is developed like the cells of any moniliform fungus, and very much after the same manner as the grains of starch. This substance generally exists in parts exposed to the light, to which it probably is indebted for its colour, and generally is not found in the same organs as starch, and frequently it occurs in plants where the latter does not. It exists abundantly in all young leaves, even in certain embryos, and in the layers of the bark of fresh shoots; and from the quantity not being increased by the continual developments of the several granules, it is fair to infer that certain numbers are continually being appropriated towards the nutrition of the plant, as the grains of starch are known to be.

It can scarcely be supposed that they serve merely the purpose of giving the green colour to the leaves, because a process less complicated could effect such an end, either the colouring of the membrane, or, as in petals, the colouring of the contents of the cells.

It was observed that several theories had been advanced by our continental neighbours respecting the nature and structure of the grains of fecula or *starch* found abundantly in the cells of certain organs destined to give origin to new growths, as the seed, tuber, rhizome, root, bulb, and pith—Raspail maintaining that each grain was a young cell, connected to the parent one by a distinct mark, denominated the *hilum*; Fritzsche supporting the

view, that a grain of starch was a collection of deposits around a nucleus, the whole not enveloped in a membrane—a theory appearing to have been founded from the examination of those grains only which happen to have concentric markings; Payen, a later authority, stating, that the grain of starch is composed of a cell containing a succession of deposits, which give origin to the markings exhibited on the potato and some other starch grains, and which are supposed to have entered at the hilum by an aperture, and to be conducted by a tube to the interior. It was stated, that the latter theory, which, being much nearer the truth, fully proved the two former to be untenable, still it was observed, that even that of Payen was not strictly correct according to Mr. Quekett's own observations.

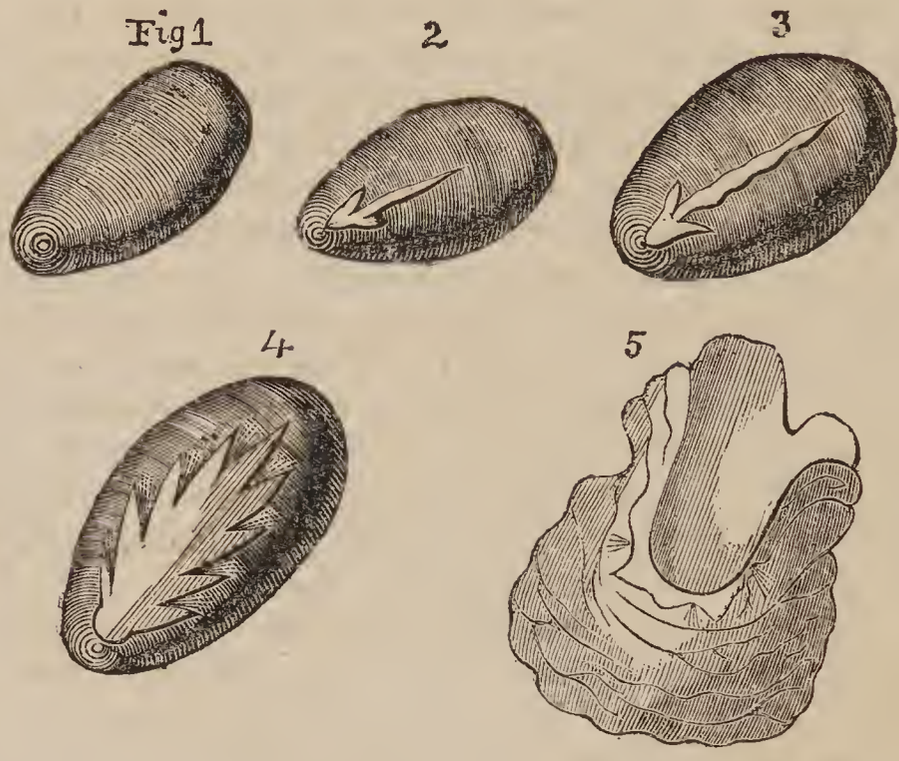
It was observed, that it was by no means certain that there existed an aperture in the grain whilst in the growing state; but after having arrived at perfection, one or more fissures are more or less evident at the hilum, just like the dehiscence of some ripened seed-vessel: there could be no necessity for an aperture for the amylaceous contents to enter, for they do not exist in the juices of the cell which contain the starch-grain, but are elaborated within the grain itself, out of the material furnished by the sap of the plant; consequently the lines on many varieties of starch-grains cannot indicate a series of deposits—the most external the oldest, but on the contrary, a series of increments of growth of the grain itself, the external marking indicating the latest extension; and it is well known that fluids pass in and out of ordinary cells without any aperture being visible.

No doubt can exist respecting there being an envelope or cell to the amylaceous matter; for if a few grains of any starch be boiled for a few seconds in water, and then allowed to cool, at the bottom of the vessel will be seen a deposit, which, when submitted to the microscope, will be found to be composed of collapsed empty cells, which formed the covering of the grain.

It was mentioned, that no accurate idea of the structure of starch could be obtained without its being submitted to heat in water and reagents, and viewed under the microscope whilst they are being applied. To effect the first in the best mode, it was advised to take a slip of glass, three inches in length and an inch and a half in width, then to lay a few grains of *tous les mois*, moistened with water, and covered with another slip of glass, one inch and a half in length, and half an inch in width; if the glasses so prepared be laid on the stage of the microscope, the mirror being removed, let a small lighted taper be placed beneath, which supplies both heat and light, and so adjusted that the heat shall be applied to one end only of the upper slip of glass. If, now, the focus be so arranged that certain grains are

kept in view, the following will be the changes that can be witnessed:

The hilum, as soon as the heat has attained a certain temperature, will be seen to present a pink hue (indicating that some thin membrane is decomposing the light), and the grain will be observed to alter its shape, becoming distended, and slightly moving; soon after this one or two fissures will commence at the hilum, and extend rapidly in the direction of the longer axis of the grain, breaking through the envelope with a coarse serrated fracture; the contents now are discharged, and nothing remains visible but a diaphanous empty corrugated cell, which has enlarged three times from its original dimensions. (See figs. 1, 2, 3, &c.)



These changes are almost too rapid to be followed by the eye, but if the glass be now moved so as to view the grains in a direction towards the cool end of the glass on which they are laid, many will be found that will illustrate the several stages from the commencement of the bursting to their final destruction.

In examining the grains in progress towards emitting their contents, it can be distinctly seen that the curved lines visible on the entire grain can be detected going across the serratures of the fissured edges, and when the cell has extended to its utmost, and becomes empty and collapsed, rugæ or folds can be detected, which however do not appear to be the original markings, which are now obliterated by the extension of the membrane.

If granules of *tous les mois* or others having markings, be placed on a slip of glass, and moistened with water, and covered

with another piece of glass, and slightly tinted by iodine (for the purpose of rendering the subsequent changes more visible) and now the whole be submitted to the microscope, and viewed with a power of 300 linear, whilst a drop of concentrated sulphuric acid is being added to the edge of the top slip of glass, the following changes will be apparent:

When the acid comes into contact with the grains, they slowly absorb it, which gradually distends the cell until it attains a size four times the original without bursting, a group looking now like cellular tissue. This enlarging can be readily followed by the eye, when it appears as if the markings were rugæ, which become obliterated as the cell distends from within, an act seeming so rapid that the solution of different layers of matters within could not explain, and the lines do not disappear on all sides as a substance dissolving, as the extension operates in one direction only. Whilst this is going on, the hilum can be distinctly seen either as a point or a fissure, but when the distension is complete, all trace of it is lost, and the cell is perfect without aperture, showing that the cracks, when they exist, are in the brittle contents, and not in the membrane. It is very easy to burst these distended cells by the slightest pressure, when their contents escape, and the smallest aperture can then be seen, and whose existence is also indicated by the cell becoming empty and collapsed, as if burst by the application of heat.

This mode of viewing starch-grains, favours a notion that each grain is a cell so constructed as to admit of distension by the entrance of liquids capable of dissolving or softening its contents, just as if a moistened bladder be compressed by the hand, and air then slowly blown into it, when the folds become obliterated by the distension; only in the case of the starch-grain the folds appear in most cases, though not in all, arranged in a regular order.

From these observations, it was considered that the grain of starch was composed of a corrugated cell (in some cases there appears to be two envelopes, the outer bursting, the inner entire) enclosing amylaceous matter, without an aperture at the hilum in the recent state, and that the markings were folds, which admitted of the extension of the cell under particular circumstances.

These views were corroborated by the statement that all grains of starch did not exhibit the concentric lines, nor did every kind exhibit the hilum or supposed aperture, and it could not be doubted that the growth and structure of these varieties were different from those of other plants, and it did not appear very improbable that Raspail's idea of their being young cells was altogether incorrect,

It was mentioned that in *Vallisneria Jacquiniana*, Sprengel,

the opportunity offered of seeing starch-grains *in situ*, without injuring the plants, and where also it could be observed how these bodies were multiplied, which was precisely after the manner of the lowest fungi, and the sporules of mosses or the grains of pollen, viz., one cell giving origin to another by pullulation or fission, or one cell developing three or four others in its interior; precisely these modes are to be witnessed also in the development of chlorophylle, from which it appears that these two substances appear after the nature of parasites or *entophytes*, or perhaps more like subsidiary gastric organs, preparing by their growth and properties, matters immediately fitted for nutrition from the crude juices of the sap.

It was remarked that the position of fatty oils among *not organized nutritious substances* may require some explanation, but as it has already been stated that these products occur so abundantly in and about the embryo of the seed, and disappear during germination, that it is more consistent to consider such substances highly nutritious, than of the nature of excretions, and not nutritious.

In the second division of the table, *milks* and *volatile oils* (of particular character) have been associated, as the only products entirely to be considered true secretions, because no others possess a distinct and peculiar apparatus for their production; milk being always in singular ramifying vessels, denominated by their discoverer, Schultz, *ducts of the latex;* whilst *volatile oils* are elaborated in vesicles, vittæ or glandular bodies situated on the surface or in the interior of leaves or pericarps of fruits.

Wax and *resinous matter* were considered *excretions*, on account of their being found extravasated, and not confined to the interior of the cells of the tissues in which they are formed.

Two divisions were added to the table of products, in order to embrace certain matters which could not be included under any of the former divisions, viz., matters found in the interior of cells, and those substances that form an integral part of the organization of tissues, yet not truly of vegetable character. Under the former have been placed two kinds; *soluble*, such as citric and tartaric acids, &c.; and *insoluble*, such as the various forms of *zephides*. Under the latter have been placed *colouring matters*, which are blended with the tissue, and of *vegetable* nature, and in the last place, *mineral* substances, such as *silica*, *lime*, *potash*, *soda*, &c., which become an organized portion of the skeleton of the plants, as phosphate of lime does in the vertebrate, or as carbonate of lime in the molluscous animals.

[The several subjects and views were illustrated by diagrams and specimens from the museum of the Society—the object of the lecture being to prove, that certain productions are peculiar to certain organs, and even to particular tissues.]

PHARMACEUTICAL MEETING,

DECEMBER 13th, 1843.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

ON MERCURIAL OINTMENT.

BY MR. JOHN DALLAS.

In the Pharmaceutical Journal for August of last year, there is a notice of a paper read before the Pharmaceutical Society, on the use of oxygenized fats in the preparation of mercurial ointment. From the statements and experiments made on that occasion, it appears certain that these oxygenized fats have a peculiar action upon the mercury, but as the theory of that action is not very distinctly explained, I beg to offer a few remarks on the subject. At present there appear to be two opinions as to the condition of the mercury in the ointment: the one, that the metal is merely distributed mechanically through the fat in a state of very minute division; and the other, that it is not in the metallic state at all, but has been converted into an oxide. The advocates of this latter doctrine adduce, as evidence in support of their theory, the fact, that fats carrying with them a supply of oxygen, act readily upon the metal, while fresh or unoxydized fats will not do so. Neither of these theories, however, I think can be considered as fully accounting for the phenomena observed, and for the following reasons:

In the first place, if the mercury be merely in a state of mechanical division, fresh fats should be as efficient in effecting the division as the oxydized ones, which is not the case. In the second place, if we refer to the experiments tried before the Society, as noticed above, we shall find that one part of the oxygenized fat took up readily sixty-four parts of mercury — how much more it could have taken up does not appear to have been tried. However, with these proportions, let us see what kind of an oxide we could get. The equivalent of oxygen is 8; that of mercury 202, or in the proportion of about 1 to 25; in the above experiment we have the proportions as 1 to 64: the oxydized fat must, therefore, have afforded *rather more than two and a half times its own weight* of oxygen to form a protoxide—a position which can hardly be maintained. I believe the supporters of this theory have attempted to get over this inconsistency, by supposing the metal to be in a lower state of oxydation than that of protoxide;

but the quantity of oxygen which the fat can supply must be exceedingly small, as will be seen from the preceding calculation: and we must at any rate assume the existence of a sub-oxide entirely unknown to chemists. An oxide in such a low state of oxydation, as to be without a single analogue in the whole range of inorganic chemistry.

At best, this merely shifts the difficulty from one point to another, as the existence of the sub-oxide has still to be proved.

As a further objection to the oxide theory, I may mention that Dr. Pereira states, in his *Elements of Materia Medica*, that if this ointment be exposed to a low temperature, metallic mecury separates from it. Now, I believe, no degree of cold, however intense, is capable of reducing a metallic oxide; at least I never heard of a case of the kind.

We may therefore, I think, safely say, that neither of these theories accounts in a satisfactory manner for all the phenomena observed.

Let us now see what theory will account for these phenomena.

If we consider the mercury in the ointment to be in a state of *solution* (if I may use the term), I think we shall find that we shall be fully able to meet every contingency. By solution, I mean that the metal is in a state exactly similar to that of a salt dissolved in water, or of a resin or other substance dissolved in spirit; and to account for the difference in the action between fresh and oxydized fats, we have merely to suppose that the oxygen taken up by the fat is chemically combined with it, and that the resulting compound is, or contains, a principle capable of dissolving the mercury.

There are numerous analogous cases known to chemists; I will only mention one by way of illustration. We all know the relation which exists between ether and alcohol; the latter being merely a hydrate of the former; and that we can convert one into the other, by adding or subtracting an equivalent of water. But ether and alcohol, though so closely allied, possess very different solvent powers; certain substances being perfectly soluble in the one, but insoluble in the other. Take the colouring principle of cochineal as an instance. If you digest pure ether upon cochineal, not a single particle of the colouring matter will be taken up; but convert that same ether into alcohol, by the addition of an equivalent of water, and it becomes at once a perfect solvent of that principle.

From facts which have been proved respecting the behaviour of fats with mercury, I think we are quite justified in inferring that the same kind of action takes place in the formation of our ointment. Fresh adeps is not a solvent of mercury; but by the addition of a small quantity of oxygen to this same adeps, a prin-

ciple is produced which dissolves it readily. Upon this theory all the various phenomena can be satisfactorily accounted for.

Thus the long continued trituration of fresh adeps effects the solution, by constantly bringing fresh portions of the fat into contact with the atmosphere, till sufficient of the oxydized principle is produced. By treating the fat with nitric acid, as proposed by Mr. Walton, or by exposing it in thin flakes to the action of the atmosphere for a considerable period of time, as proposed by Mons. Dorly, the same effect is produced. The action of the portion of old ointment sometimes employed, depends on the same principle. We have already seen that the oxydized fat is capable of taking up a large quantity of mercury; the fat of the old ointment is in a similar condition, and as it only holds in solution about its own weight of the metals, it acts readily on a further quantity. We thus form a saturated solution, and this solution is then diffused through the fresh fat. In the same way we can account for the separation of metallic mercury on exposing the ointment to cold, as it is well known that menstrua have their solvent powers diminished in proportion as their temperature is reduced. I suspect, however, the separation of metallic mercury by cold can only take place in fresh ointment prepared by the process of trituration, in which the fat contains just sufficient of the oxydized principle to dissolve the mercury (the trituration being of course discontinued as soon as the metal is dissolved), and being thus saturated, is readily affected by a change of temperature.

Mr. Mowbray differed from the author in opinion respecting the analogy between mercurial ointment and solutions in general. He thought the separation of the mercury from the lard by a reduction of the temperature was no proof that it had been in solution, since the same effect was produced by the application of heat. He observed, that in many cases, as for instance, in the case of lime-water, the solvent power of the menstruum is diminished by an increase of temperature.

Mr. Bell enquired, whether Mr. Dallas considered his theory to apply to *blue pill* and *mercury with chalk*—it being generally believed that the mercury is in the same state in these preparations as in the mercurial ointment?

Mr. Dallas replied, that his observations only applied to the ointment.

Some discussion ensued on the old question of minute division *versus* oxidation; which, like previous discussions on this subject, left the matter where it was before.

SOLUBILITY OF SULPHATE OF POTASH.

(AN ATTEMPT TO REFUTE CERTAIN PROPERTIES ASCRIBED TO THAT SALT.)

BY MR. G. M. MOWBRAY.

THOSE who were present at the last meeting of the PHARMACEUTICAL SOCIETY, will remember that Mr. Redwood communicated some experiments, and drew some deductions therefrom, in reply to certain statements inserted in the *Medical Gazette* for October 27th, of which statements I happen to have been the author. In the paper read by our Professor of Pharmacy, which has been published in the Transactions of the Society, the writer has endeavoured to attach some properties to sulphate of potash, at variance with those it has usually been supposed to possess by chemical writers, and which had been assumed as matter of certainty by me in the letter I addressed to the editor of the *Medical Gazette*. The object of Mr. Redwood's paper is to prove, that the solubility of sulphate of potash is increased by the addition of carbonate of soda, as stated by Mr. Gallard and denied by me; and he attributes this phenomenon to a *partial decomposition* of these two salts, as suggested by Mr. Jacob Bell. It has been since stated by Mr. Redwood, that this action is in opposition to what is conceived to be the prevailing power of affinity; and further, that the resulting compound is a mixture of sulphate of potash, carbonate of potash, and sulphate of soda, with excess of carbonate of the same base; and, lastly, that this change is a result of the greater solubility of the sulphate of soda, when formed; in contradistinction apparently to the usual law, that variation of solubility is a condition subsequent to a previous chemical change. The fallacy of this reasoning is apparent; being, in fact, the error of attributing a preceding cause to some subsequent effect, to be produced after such cause shall have come into operation.

We are indebted to Mr. Waugh for an observation upon Mr. Redwood's *rationale*, not less prompt in itself than true in its application, that admitting the premises, still the conclusion did not lay; that is, if, when carbonate of soda was added, a less quantity of water sufficed to form a clear solution, owing to decomposition and disappearance of a portion of sulphate of potash from the field, it should not be thence inferred that sulphate of potash was rendered more soluble, but that rather there was less sulphate of potash to dissolve.

Dr. A. T. Thomson's general remarks on the comparative medicinal properties of sulphate of potash and sulphate of soda, seem to me as irrelevant to the question at issue, and by no means

as relieving Mr. Redwood from the anomaly in which Mr. Waugh detected him.

As regards the hint I had thrown out, in reference to the mechanical condition of its crystalline particles causing excessive irritation, Dr. Thomson differs from such explanation; I can only remind this eminent therapeutist, that "patches of undissolved salt were found deposited in the stomach and intestines, and on these parts inflammation had evidently set up;" if, then, the chemical axiom, "*corpora non agunt nisi soluta*," will bear a free translation, perhaps, "sufficiently pure for medical use;" "if bodies act on the stomach, when undissolved, it must be mechanically," may not the view I have suggested demand his reconsideration?

To return to Mr. Redwood, whose experiments have led him to announce:

1st. That the solubility of sulphate of potash may be increased by the addition of a portion of carbonate of soda.

2d. That decomposition ensues when carbonate of soda is added to sulphate of potash; sulphate of soda and carbonate of potash being formed to a certain extent.

3d. That the state of aggregation appears to influence very considerably the proportions in which sulphate of potash dissolves in water; thus, according to Mr. Redwood, one part of sulphate of potash *in crystals* requires sixteen parts of water at 60° for its solution, whilst one part of sulphate of potash *in powder* may be dissolved in 9.5 parts of water at the same temperature.

Setting aside, then, Mr. Redwood's reasoning, I come to an examination of his facts, and I would observe that, at the outset, he appears to have confined his tests as to the purity of the salt simply to the detection of metallic impurities, chlorides, and nitrates, and by this partial examination to have omitted taking any steps with a view to ascertain whether the bases, lime or magnesia, were present or otherwise.

To begin at the end, Exp. 6 proves that the salt used in Exp. 1 was impure, since the former (Exp. 6) indicated that sulphate of potash might be dissolved in the proportion of 1 to 9.5, whilst in the latter (Exp. 1) one part required 11.63 parts for its solution.

Exp. 2. Assuming the salt to have been contaminated with lime or magnesia, and Mr. Redwood neglects to assure us that such was not the case, this experiment merely proves that the impurity was rendered soluble in an excess of sesquicarbonate of soda, since Exp. 6 shows that 58 grains of sulphate of potash may be dissolved in 528 grains of water.

Exp. 3 corroborates the preceding view, and further instructs us that the impurity is less soluble in bicarbonate of potash, than in sesquicarbonate of soda.

Exp. 5 is opposed to the accuracy of Exp. 1—it merely proves that a certain time was required to disentegrate and dissolve a certain salt, whose purity may be doubted from the preceding experiments.

I will first premise that I did not assert, in the *Gazette* of Oct. 27th, "that sulphate of potash is not more soluble in solution of carbonate of soda than in distilled water," without performing an experiment simple and easy of execution: it consisted in saturating distilled water with sulphate of potash, then filtering; carbonate of soda was added in the proportion of thirty grains to two drachms of the sulphate dissolved, the specific gravity was taken, more sulphate of potash was added, yet constant agitation did not appear to diminish the quantity last added, neither was the specific gravity increased. Such were my rough notes at the time. Subsequently to the above, and immediately after perusing Mr. Redwood's paper, I prepared a pure sulphate of potash, by neutralizing a solution of potash (prepared by adding potassium to very pure distilled water) with a perfectly pure dilute sulphuric acid, half the solution thus obtained was evaporated and crystallized, and the remaining half precipitated by the addition of alcohol to a concentrated solution. With such a salt I find:

1st. That one part may be dissolved in nine parts water at 60°.

2d. That the addition of pure carbonate of soda, or of pure bicarbonate of potash, will neither increase nor decrease its solubility.

3d. That whether in powder or in crystals, the same proportions are assumed, it merely being a question of time, and this latter may be modified by agitation.

These views being diametrically opposed to the announcement of Mr. Redwood, I wrote to that gentleman for a sample of the crystals he had used, and he was so obliging as to forward me some, stating, that "he had, previously to performing his experiments, dissolved and recrystallized the salt, of which he had left me a sample." I thereupon dissolved four drachms of these crystals in twelve parts of distilled water; a slight curdy residue was left, to which I added one ounce and a half of distilled water, which appeared to barely dissolve this residue.

To the solution of this residuary matter I added a solution of oxalate of ammonia—a slight but distinct precipitate subsided in the course of a few hours.

I then divided the six ounces of normal solution of sulphate of potash into four portions of one and a half ounce each.

No. 1. I used as a comparative standard.

No. 2, tested with oxalate of potash, gave a white pulverulent precipitate.

No. 3, tested with oxalate of ammonia, furnished precisely similar results to those of No. 2.

No. 4, tested with bicarbonate of potash, gave a very slight opalescence, only to be perceived on comparison with No. 1.

Twelve hours were allowed to elapse before the effects of the above tests were noted down. These results permit me, I trust, to justify my first assertion, and to refute the properties ascribed to sulphate of potash by Mr. Redwood, in his paper read at your last meeting; it being quite evident, that the salt used by that gentleman was contaminated with sulphate of lime. It has occurred to me, that probably the crystalline structure of sulphate of potash, which has excited the attention of philosophers who have examined crystals by means of polarized light, and which peculiarity of structure has received the technical appellation of *macle*, may, in this instance, be traced to the presence of sulphate of lime, diffused through the crystal. The opacity of the commercial crystal, as compared with the pure salt I had prepared, struck me at once; and I doubt not the evidence of the polariscope, could I have commanded the use of so excellent a test, might have been adduced as additional support to the arguments I have submitted for your consideration.

The presence of sulphate of lime in commercial sulphate of potash is easily explained. Crystals of nitre contain in their interstices portions of the mother-liquor, containing muriate of lime and muriate of magnesia. This is evidenced by the fact that, however dry before powdering, crystals of nitre, after being crushed, require to be again dried, otherwise they become discoloured by the action of the deliquescent muriates on the iron mortar. In consequence of this impurity, the residuary saline mass left after the distillation of nitric acid, consists of bisulphate of potash, and the sulphates of magnesia and lime. When the neutral salt is prepared, according to the London Pharmacopœia, by igniting this mass so as to drive off the atom of acid from the bisulphate, the sulphates of lime and magnesia remain with the neutral salt: on dissolving this mass, a solution of sulphates of lime and magnesia, with the sulphate of potash, is obtained, the sulphate of magnesia remaining in the mother-liquor, whilst sulphate of lime is deposited in the crystals of sulphate of potash. When prepared, as is usual in commerce, by neutralizing the excess of acid by the addition of carbonate of lime, a still more fruitful source of sulphate of lime is furnished; and although a great portion thereof is precipitated on account of its extreme insolubility, one part requiring 431 parts (or about one grain to the ounce), of water for its solution, yet the liquid being saturated therewith, the product is invariably impure. I have no experience whether the addition of a little carbonate of soda to the clear solution would remedy

this, but throw out the suggestion as worthy of trial. I have ventured to trouble you with these remarks, partly in my own defence, and partly, because I think the intrusion of unsound hypothesis into the study of Chemistry is likely to increase the difficulty of the Pharmaceutist in his researches; and I am quite sure that he who is most interested in maintaining the views I have attempted to subvert, will gladly prefer, if his experience will permit him to recognise its truth, the explanation of an experiment in accordance with, rather than in opposition to, the powers of affinity — an anomaly which this subject first appeared to present.

Before I conclude this paper, I will venture on one observation more. In chemical analyses, where the chances of mistake are so numerous at every step, one is apt to draw a general inference from too limited an induction.

Like the knight-errants in the old story, we are ready to swear to the metal of the shield, and to stake our reputation on the results we have seen. It is true, that we have seen them, but alas! we have seen the truth *on one side only*.

December 6th, 1843.

Mr. Redwood, before offering a reply to Mr. Mowbray's paper, wished to enquire of the author, what compound he supposed to be formed by the union of carbonate of soda with sulphate of potash, so as to account for the increased solubility of the salt?

Mr. Mowbray could not give any precise information on this subject; but had seen such a salt alluded to in some foreign works.

Mr. Redwood said, the subject of the communication which had just been read might be divided into three parts. In the first place, the author appeared to admit the correctness of the experiments which he (Mr. Redwood) had described in his paper; which went to prove that the *sulphate of potash of commerce* is more soluble in solution of sesquicarbonate of soda than in distilled water. This fact had previously been denied by Mr. Mowbray, in his letter published in the *Medical Gazette;* but in the paper just read by that gentleman, no attempt was made to substantiate his former assertion; and from the manner in which he alluded to the "*rough notes*" of the experiment upon which that assertion was founded, together with the line of argument pursued throughout the paper, it was evident that the author relinquished his previous position. This, then, was the first material point in Mr. Mowbray's paper — it contained a virtual admission, that commercial sulphate of potash is more soluble in solution of sesquicarbonate of soda than in distilled water; and

that his (Mr. Redwood's) experiments establishing this fact, were conclusive.

But having admitted thus much, the author of the paper proceeded, in the next place, to take exception to certain conclusions which he (Mr. Redwood) had drawn from the result of his experiments, and to attempt to show that these conclusions were founded on imperfect data, were expressed in incorrect language, and supported by false reasoning. The construction which he put upon this part of the author's communication, was as follows:—Granted that the result of Mr. Redwood's experiments were as described by him, still the conclusions he has drawn from them are unsound, because the salt upon which he experimented was impure; moreover, had it been otherwise, his reasoning is illogical, and therefore his conclusions are wrong.

Now, he was sorry to say, that this, the second part of the subject of Mr. Mowbray's paper, commenced in error, and was made up by misquotations. He had nowhere asserted, as ascribed to him by Mr. Mowbray, that the decomposition supposed to take place on mixing together sulphate of potash and carbonate of soda, in solution, "*is a result of the greater solubility of sulphate of soda when formed;*" he had not been guilty, as represented by Mr. Mowbray, of "*the error of attributing a preceding cause to some subsequent effect, to be produced after such cause shall have come into operation;*" but Mr. Mowbray had been guilty of attempting to fasten this inconsistency upon him, by putting a construction upon his words entirely at variance with their literal meaning. The words he had employed were, "As sulphate of soda is more soluble than sulphate of potash, *the solution* of the latter will be promoted by the admixture of carbonate of soda, in proportion to the greater solubility of the newly-formed salts, and to the extent to which double decomposition takes place." He had not said, as represented by Mr. Mowbray, "that the state of aggregation appears to influence very considerably *the proportions* in which sulphate of potash dissolves in water," nor "that one part of sulphate of potash in crystals *requires* sixteen parts of water, at 60°, for its solution." These were misquotations; and it would have been just as easy, in these cases, for Mr. Mowbray to have quoted the exact words which he (Mr. Redwood) had used, as to employ other words, conveying a different meaning.

The author of the paper had taken exception to an expression which he (Mr. Redwood) had used, and had laid some stress upon the circumstance, that in describing the effect of adding carbonate of soda to sulphate of potash in water, he had said, that the former increased the *solubility* of the latter. Now, he could only designate this objection as a frivolous one. The form of expression

was commonly used by chemical writers in similar cases; it was quite intelligible, and, as he believed, was not incorrect.

But, then, he was told that his conclusions were erroneous, because the salt on which he had experimented was impure, being contaminated with sulphate of lime. This assertion, he (Mr. Redwood) was prepared to refute. He was quite satisfied that the salt he had used in his experiments was pure sulphate of potash—at least, that it contained no impurity that could interfere with the results, or that could be detected by the usual tests. It was true that Mr. Mowbray had said, the sulphate of potash which he (Mr. Redwood) had sent him, and which was part of the specimen used in the experiments, when "tested with oxalate of potash" or "oxalate of ammonia," "gave a white pulverulent precipitate," but he (Mr. Redwood) had not been able to verify this statement. After dissolving, filtering, and recrystallizing the sulphate of potash of commerce (he had used some of that sold by Howards of Stratford), he was unable to detect a trace of lime by the addition of oxalate of ammonia.

He thought the manner in which Mr. Mowbray had accounted for the presence of sulphate of lime in sulphate of potash, was by no means satisfactory; because, even admitting that sulphate of lime was present in the mother-liquor, it would not be likely to go down with the salt during the crystallization, as the extent of its solubility was nearly the same at all temperatures; and should a minute quantity be found to contaminate the salt as usually met with in commerce, this would certainly remain in the mother-liquor during the recrystallization to which he (Mr. Redwood) had submitted it.

But supposing that the sulphate of potash used in the experiments had contained sulphate of lime, he was quite at a loss to understand how this should account for the solubility of the sulphate of potash being increased by the addition of carbonate of soda. He had expected to find that Mr. Mowbray was acquainted with some compound formed by the mixture of sulphate of lime and carbonate of soda, more soluble in water than the sulphate of lime itself, for in no other way could the facts of the case be explained. It was easy, however, to try the effect of mixing together solutions of sulphate of lime and of sesquicarbonate of soda, and the meeting would have an opportunity of seeing the result of such a mixture, the product being, as was well known, a dense precipitate of carbonate of lime. So far, then, from the presence of sulphate of lime accounting for the phenomenon observed on dissolving carbonate of soda with sulphate of potash, the very reverse would be the case, and the carbonate of soda would immediately detect the sulphate of lime by occasioning a precipitate of carbonate of lime.

There was one other point in Mr. Mowbray's paper which required noticing, and that formed the third part of the subject to which he (Mr. Redwood) had alluded. Mr. Mowbray stated, that he "prepared a pure sulphate of potash, by neutralizing a solution of potash (prepared by adding potassium to very pure distilled water), with a perfectly pure dilute sulphuric acid;" and that with such a salt be found, "that the addition of pure carbonate of soda, or of pure bicarbonate of potash, will neither increase nor decrease its solubility." Now, he had no doubt it would turn out, that Mr. Mowbray was as much in error in this case, as he had proved him to have been in all the others. Satisfied as he was of the purity of the salt on which he had experimented, and a specimen of which was then on the table, both crystallized and in solution, so that any gentleman present might test it for himself, as he had already done in their presence, he thought it quite unnecessary to resort to the roundabout and expensive process of preparing it from potassium, especially as the potassium itself would be as likely to contain impurities as the salt obtained in the usual way.

In conclusion, he had only to add, that after carefully examining Mr. Mowbray's paper, he found nothing in it to invalidate any one statement that he (Mr. Redwood) had made in reference to sulphate of potash. The facts set forth by Mr. Mowbray, he was quite sure, would not stand the test of rigid investigation. They were entirely at variance with the results which he (Mr. Redwood) had obtained; and under these circumstances, seeing that the whole matter turned upon questions of fact, he had requested Dr. Ure and Mr. Fownes to give him their opinions upon the principal points at issue. As those gentlemen were present, the meeting would have an opportunity of hearing what the result of their examination of the suspected sulphate of potash had been; and he (Mr. Redwood) would therefore leave the question to be decided upon the evidence which careful experiments alone could afford.

Dr. Ure said he had been a good deal accustomed to the examination of substances with the view of detecting microscopic quantities of impurity. He had examined the sulphate of potash given him by Mr. Redwood, and certainly he had not been able to detect any sulphate of lime in it. Oxalate of ammonia was an exceedingly delicate test for lime, as the oxalate of lime was quite insoluble in water, but this test did not occasion the slightest opalescence with Mr. Redwood's sulphate of potash. The addition of a drop or two of solution of sulphate of lime would show how minute a quantity of the latter may be detected by the test. He thought Mr. Redwood was quite justified in considering his sulphate of potash free from lime.

Mr. Fownes said, with reference to the double salt of lime and soda which had been alluded to, he was quite satisfied that such a compound could not exist in solution. Several Chemists—Berzelius, Berthier, and Gmelin, for instance—described a compound formed from carbonate of soda and sulphate of lime, or from sulphate of soda and carbonate of lime; but Gmelin particularly mentions, that in making this compound, the salts are to be previously calcined; so that it is evident that the absence of water is essential.

Then, with regard to the purity of Mr. Redwood's sulphate of potash, it was scarcely necessary for him to say a word, as the evidence was before them in the tested solutions on the table. He had himself previously examined the salt, and could detect no lime in it. A small quantity of a flocculent matter certainly did collect in the tested solution, after standing for some time, but this had no resemblance to the precipitate formed by oxalate of ammonia with salts of lime. He would not undertake to say positively what this was, as he had not minutely examined it; but he would express an opinion, that supposing it to be oxalate of lime, and that in quantity it was ten times as much as was really found, still it would not affect the results described by Mr. Redwood. He thought it most probable that this flocculent matter was a species of mycoderma, similar to what was called mother-of-vinegar. It was well known that this flocculent matter was frequently met with in saline solutions, and especially in oxalate of ammonia; and Mr. Mowbray's bottle of oxalate of ammonia, then on the table, contained some of it. He thought Mr. Redwood's experiments had been carefully performed; the results were quite in accordance with those met with in other analogous cases, and he (Mr. Fownes) agreed with him in the conclusions which he had drawn from them.

The Chairman said, there was one point in the matter under discussion, which was of more practical importance to the members of the Pharmaceutical Society, and he might also add, to the members of the Medical Profession, than some of the other chemical questions involved: and that was, that the sulphate of potash of commerce was more soluble in water with the addition of carbonate of soda than without. They all seemed to agree on this point, whatever difference of opinion might exist on some others.

REGULATIONS

ADOPTED AND CONFIRMED BY THE COUNCIL,

FOR THE

EXAMINATION AND REGISTRATION

OF

MEMBERS, ASSOCIATES, AND APPRENTICES.

Candidates for the Major or Minor Examination must send in their testimonials to the Secretary, on or before the first day of the month, which testimonials must consist of—

For the Minor Examination, either an indenture of apprenticeship, or a certificate from a Chemist and Druggist, with whom the candidate has been regularly educated.

For the Major Examination, a similar testimonial, if the candidate be not already an Associate of the Society; and he must show to the satisfaction of the Board that he is in business on his own account, or intends to commence, or that he has been an Assistant for the term of five years since the expiration of his pupilage.

THE MINOR EXAMINATION

For the Certificate of qualification to act as an Assistant to a Chemist and Druggist, and to become an Associate of the Society, is conducted in the London Pharmacopœia; embracing an elementary acquaintance with Chemistry, Materia Medica (including a knowledge of the external character of indigenous medicinal plants), Practical Pharmacy, Physicians' Prescriptions, and the Antidotes for common Poisons.

THE MAJOR EXAMINATION,

For the Diploma as a Member of the Society, is on the same subjects, but on a more extended scale.

APPRENTICES

Coming to reside within ten miles of London, must present themselves for the Classical Examination at the Society's house; beyond that distance, they are at liberty to undergo the examination by any qualified person, whose certificate, if satisfactory, will be received by the Board.

Notice must be given to the Secretary, on on before the first of the month, by Apprentices coming up to the Board in London; and forms of the certificate for the country, may be had on application to the Secretary, which, when filled up, must be returned: when, if approved by the Board, the Pupil will be registered (and

on payment of the annual subscription of one guinea will be entitled to enjoy the privileges of an Associate).

THE FEE FOR REGISTERING

The Apprentices or Pupils of Members, is five shillings; if the master be not a member, the fee is ten shillings and sixpence. Every Apprentice or Pupil not registered within twelve months after the date of his indentures, must pay a fee of one guinea on presenting himself for examination as an Associate (and those who neglect to register cannot be admitted to the privileges of an Associate, without the special permission of the Council).

THE BOARD OF EXAMINERS

Meets on the third Tuesday in each month throughout the year, except in May and September, at eleven o'clock in the morning.

ORIGINAL AND EXTRACTED ARTICLES.

FRAUDS IN THE DRUG TRADE.

SUBSTITUTION OF SULPHATE OF LIME FOR PRECIPITATED CHALK.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Dear Sir,—Much mischief will necessarily arise so long as Chemists are found eager to purchase articles considerably below a fair trading price; and at once receive such into their stock, without enquiry (where such is practicable) into their chemical or medicinal qualities. An instance of substitution has just occurred to me, which, as it involves the abuse of an important remedy, should be made as publicly known as possible.

A sample of *creta præcipitata* was offered to me by a manufacturer of levigated goods in Clerkenwell, for which he asked me eight-pence per pound, being less than half the price usually charged by respectable manufacturers of the article. I desired him to leave the sample (specimen enclosed), and found upon trial, that it contained no *carbonate* at all, but consisted entirely of *sulphate* of lime (plaster of Paris), which the figure-makers *retail* at nine-pence the bag, of seven pounds weight. The consequence, or no consequences, likely to result from the exhibition of such a substance need not be dwelt upon.

Powdered Gypsum, not calcined into Plaster of Paris, is used, I believe, in the manufacture of inferior lozenges, as a substitute for sugar, and a laughable event is said to have occurred to a large wholesale confectioner, who, by mistake, used Plaster of

Paris, instead of the "*terra alba*" (as powdered gypsum is called in the trade), thereby forming a lozenge mass which set hard as soon as mixed, and became, fortunately for his customers, useless.

Whilst upon the subject of substitution and adulteration, I beg most earnestly to call the attention of our brother Chemists to the purity of their preparations, and to allow no considerations of temporary profit to interfere with the use of the very best drugs and preparations they can procure, the only course which can permanently exalt the character of the Druggist, and entitle him to that place in public estimation which his truly laborious and useful pursuits ought justly to ensure him.

I remain, dear Sir, yours very faithfully,

C. J. Hodgson.

406, *Strand, Nov.* 22, 1843.

[We have examined the sample, which appears to consist entirely of sulphate of lime. In whiteness and other external characters it resembles precipitated chalk, but the difference is readily detected by the addition of muriatic or acetic acid which occasions no effevescence.—Ed.]

SPURIOUS SAFFRON.

We have received information from several sources respecting the existence in the market of a spurious saffron, which has been offered at a very low price. In texture and general appearance, it is like genuine saffron, of rather a dark colour, the light yellow filiments being absent. It imparts no colour to spirit or water, and we believe it to be saffron from which the colouring principle has been extracted.

ADULTERATION OF BLUE PILL.

At the last Pharmaceutical Meeting, Mr. Mowbray incidentally stated that he had lately met with a sample of blue pill, in which stearine had been used in dividing the mercury, and substituted for a portion of the conserve of roses, a little otto of roses having been added to give it a flavour.

THE COBALT SHOW-COLOUR.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

19, *Southampton Row, December* 14*th*, 1843.

Dear Sir,—The difficulty experienced by your Correspondents in preparing the beautiful cobalt colour, arises most probably from an endeavour to dissolve the *pure black oxide* directly in ammonia,

forgetting that this oxide has been prepared at a red heat, and, in common with many others, is thus rendered of difficult solubility, even in some acids. Nothing, however, is easier than the preparation of this colour, for you have only to add a solution of carbonate of ammonia (Liquor Ammoniæ Sesquicarbonatis, Ph. Lond., answers well) to a solution of *pure muriate of cobalt prepared from the black oxide*, until the hydrated precipitate is redissolved, and if pure ingredients be used, the colour is prepared in an instant, and will only require dilution.

The muriate of cobalt is as readily procured as the oxide, either in the solid state or in solution; or it may be prepared by dissolving the black oxide with heat in pure muriatic acid, filtering, evaporating to dryness, and redissolving the dry salt in distilled water.

Very truly yours, T. N. R. Morson.

ON THE PRODUCTS OF DRY DISTILLATION OF TOBACCO, AND THE CONSTITUENTS OF TOBACCO-SMOKE.

BY ZEISE.

The tobacco was partially consumed in the bowl of an ordinary pipe, the smoke being conducted through Bremmer's aspirator, partly subjected to dry distillation in an iron bottle—the gas being collected in a receiver, surrounded by ice. The latter process of course yields the greater quantity of products, and was adopted in the first experiments. In addition to the usual gases, a reddish-brown aqueous fluid, and a dark mass, resembling tar, or rather a fatty matter, is obtained. On filtering the fluid, and subjecting this substance to distillation with water, a considerable quantity of a bright yellow oil passes over, and swims on the surface of the water in the receiver. This oil has a peculiarly powerful odour. The water contains ammonia in combination with carbonic acid and with other acids. The residue, distilled with dilute sulphuric acid, yields a dark brown oil, like the former oil, specifically lighter than water, but differing in odour; the latter having a very unpleasant odour. The water of this second distillation reacts as an acid. The residue of the process is a black, brittle, resinous substance; which, if first treated with water, and then dried, forms a dark brown solution with alcohol, but leaves a quantity of dark brown insoluble matter. On evaporation, this matter is found to be a dark pitch-like mass, and is probably a combination of a resin with a fixed oil.

Acetic acid dissolves a great portion of this residue, forming a dark solution, which, on evaporation, yields a portion of a brown substance, insoluble in the acid, but soluble in hot acetic acid, and separating again, on cooling, in the form of a grey fatty matter. When pure, after being washed with hot ether, this substance bears a strong resemblance to paraffine. The brown substance before mentioned is probably a mixture of resins, closely allied to the former. The resinous (nitrogenous) residue, obtained by the treatment with acetic acid, is very powerfully acted upon by concentrated sulphuric acid, whilst neither oxide of lead nor chromic acid produce any effect. If burnt with nitric acid, a greyish-brown tenacious mass remains.

The aqueous residue of the first distillation is, after filtering, clear, and of a reddish-brown colour; it yields, on distillation, an oil, possessing the qualities of that first mentioned. Distilled with dilute sulphuric acid, an

aqueous acid fluid is obtained. This fluid is a solution of butyric acid. The peculiar odour of this acid becomes very evident if the solution be treated with caustic potass, and evaporated. On evaporation, and with the addition of alcohol to the mass, the greater part is redissolved, and a salt is obtained, which emits the odour of butyric acid. If phosphoric acid be now added, and heat applied, the butyric acid will separate in part as an oil, and will in part pass over in the aqueous solution. This solution Zeise neutralized with barytes, and obtained, by evaporation, a crystallized salt, which corresponded in its properties with butyrate of barytes. The butyric acid is contained also, in combination with ammonia, in the alkaline solutions obtained by the distillation, and exists as free acid in various productions of the dry distillation of tobacco.

The butyric salts yield a green precipitate with chloride of copper, and a copious white precipitate with nitrate of mercury and nitrate of silver, and with acetate of lead. The precipitate of silver becomes dark by boiling.

The oil obtained by the distillation of the fatty matter was washed repeatedly with water, and the latter then separated by chloride of calcium; and, after filtration, the oil was twice rectified. A small quantity of tar-like substance remained after each process. This was subjected to analysis, and appeared, on distillation, as an oil of a bright yellow colour, but becoming dark on exposure to the air, although it remains transparent. Its specific weight is = 0.870, and it boils at 195°. It is combustible; burning with a bright flame, and depositing much carbon. It is insoluble in water, but very soluble in ether; neither reddens litmus, nor turns turmeric brown. It absorbs muriatic acid gas, and becomes pulpy; assuming with it a brown-red colour, but resumes the original colours on addition of ammonia.

The oil was, by analysis, found to consist of

	Experiment.	*Equivalents.*	
Carbon	71.225	11 = 825.00	71.00
Hydrogen	12.012	11 = 137.25	11.79
Oxygen	—	2 = 200.00	17.21
		1162.25	100.00

and is not free from a nitrogenous substance, yielding three per cent. of nitrogen.

Sodium does not act upon the empyreumatic oil of tobacco; potassium acts powerfully but slowly upon it. Both metals react very powerfully and quickly, however, if heat be applied. In this case the oil is changed to a thick brown red mass, yielding on distillation a volatile aromatic oil, and a pitch-like residue. If hydrate of potass be boiled with this oil for five or six hours, and then distilled, a less volatile oil, specifically lighter than the latter, passes over, in which potassium remains unchanged. The alkaline residue of this distillation, when freed of carbonized matter by filtration and neutralized by dilute sulphuric acid, evaporated, treated with alcohol and again evaporated, yields a salt, the butyrate of potash. By distilling the salt with phosphoric acid a portion of butyric acid was even obtained. This acid is probably formed by the addition of water during the process of distillation, for it can be in like manner obtained with the hydrate of barytes but not with an alcoholic solution of potass. In the process of distillation with potass a strong odour of ammonia is emitted. The analysis of the oil thus obtained gave in 100 parts:

79,896 C, 10,015 H, 10,089 O.

The dark brown fetid oil passing over in the distillation of the pitch-like residue before mentioned, with dilute sulphuric acid, reacts as an acid, even when washed with water. When distilled with a solution of potass, a white thick oil was obtained, giving no traces of butyric acid.

The smoke of tobacco passed through dilute sulphuric acid leaves a

greyish yellow spongy sediment in the solution, which assumes a brown colour on exposure to the air. When dried it forms a powder insoluble in water, alcohol, ether, solution of potass, and in the dilute acids. It has no odour, and carbonizes at a certain heat. A solution of potass, through which the smoke was passed, contained empyreumatic oil, empyreumatic resin, ammonia, carbonic acid, a small quantity of acetic acid, and a large proportion of butyric acid. The latter acid Zeise demonstrated by neutralizing the solution with dilute sulphuric acid, evaporating and re-dissolving the pitch-like residue with alcohol, by again evaporating and examining the remaining salt, which then emits the odour of butyric acid, if heated with sulphuric acid. With the reagents used in the former experiments the salt gave similar precipitates.

The empyreumatic oil is obtained in the process of smoking from the deposits on the tube. By washing the tube through which the smoke had passed with ether, by passing this brown solution through a filter, dissolving the greyish brown residue in hot ether, which is again deposited on cooling the fluid, paraffine will be obtained. The insoluble portion remaining after these proceedings will be butyrate, acetate, and carbonate of ammonia. If the ether be now driven off from the brown solution, a brown tar-like substance will remain, which, on distillation with water, yields empyreumatic oil, and a pitchy residue.

The constituents of tobacco-smoke and of the products obtained by the dry distillation of tobacco are therefore, *a peculiar empyreumatic oil, butyric acid, carbonic acid, ammonia, paraffine, empyreumatic resin, water*, a little *acetic acid, carbonic oxide*, and *carburetted hydrogen*. It is deserving of observation, that no creosote is formed in this distillation, which will account for the circumstance that tobacco smoke is less irritating to the eyes than wood smoke.

Porto Rico tobacco was used in these experiments, but the difference in the taste of various tobaccos would lead to the idea that they vary in composition, nor are we yet certain, unless the leaves of the tobacco be found to contain these constituents, that they are not formed in the process of distillation.—*Pharmaceutisches Central Blatt.* Nos. xl. and xli., 6th and 13th Sept., 1843.

REMARKS

ON THE RESPECTIVE VALUE OF THE DIFFERENT TESTS

PROPOSED FOR

THE DETECTION OF A DIABETIC STATE OF THE URINE.

BY GOLDING BIRD, A.M. & M.D.

Assistant Physician to, and Lecturer on Materia Medica at Guy's Hospital.

(From the London Medical Gazette).

In the treatment of a disease so intractable and fatal as diabetes too generally proves, it becomes of essential importance to detect the first deviation from health. The earliest evidence of this, in the disease in question, is, as is well known, to be sought for in an examination of the urine, as a saccharine condition of that secretion is at least the most constant, if not the necessary, accompaniment of almost every phase of diabetes mellitus. It must not be supposed, however, that the existence of traces of sugar in the urine is indicative of the necessary presence of a confirmed diabetes ; for it is beyond all doubt that small quantities of this principle may occasionally exist as the result of a depraved state of the primary or secondary assimilative processes. Still, as far as experience has extended, it has shown that such a condition of the urine must be

regarded with great anxiety as a most suspicious symptom ; as one which, at least, points out the existence of a most deranged condition of the functions of the stomach, and one which may, in all probability, if its cause be unchecked, be the forerunner of one of the most intractable diseases falling under the province of the physician.

It is true that in advanced diabetes, where the disease has become confirmed, and the system has suffered severely from its depressing influence, the increased quantity of urine, coupled with its high specific gravity, and its general physical characters, will at once lead to the detection of the disease. Every one who has attended much to the pathology of the urine, must have, however, met with cases of tolerably well-marked diabetes, *quoad* the general symptoms, in which, nevertheless, neither the quantity nor specific gravity of the urine would have by themselves been sufficient to lead to a suspicion of the true nature of the disease. A remarkable illustration of this fact occurred in the person of a young woman, who, in the past summer, was a patient in Guy's Hospital (in Dorcas ward), under the care of Dr. Barlow. She had previously been a patient of my own, and then presented well-marked constitutional symptoms of diabetes, with the exception of the absence of the excessive thirst and diuresis. This girl was twenty-eight years of age, but had never menstruated. The peculiar state of the tongue, which resembled a piece of raw flesh, and the harsh skin, induced me to examine the urine. The density of this fluid was but 1.022—scarcely above the average, and she passed but from three to four pints in twenty-four hours. I however found that it contained a large proportion of sugar. In a few weeks the quantity increased to eight or ten pints in twenty-four hours, and she ultimately fell a victim to confirmed diabetes. There is at this moment, a man, about sixty years of age, in the hospital (Naaman ward), labouring under diabetes, who, when he first came under my care among the out-patients, attracted my attention by his melancholic expression and harsh skin. On enquiry, I found that he passed but from three to four pints of urine in twenty-four hours, and the specific gravity did not exceed 1.024. It was, however, loaded with sugar. In this case the diuresis, or excessive discharge of urine and its high density, did not appear until some weeks after I had detected the presence of the disease. I have had, for nearly four years, a patient occasionally under my care (a greengrocer residing in Goswell Street), with diabetes, who, when first I saw him, had neither diuresis nor increased density of the urine ; and these symptoms did not appear until some months after, although the urine was strongly saccharine the whole time. I need not multiply references to cases of this kind, as no doubt can exist as to the presence of diabetes, for at least some weeks, in cases where the indications afforded by the general symptoms appear to be negatived by what, on a very superficial view, may be taken for a healthy condition of the urinary secretion. Of course, the question of the probable presence of sugar can at any time be solved by chemical analysis, but this involves a considerable expenditure of time, as well as an amount of tact in investigations of this kind not always at the command of every practitioner ; and hence the importance of possessing some test of the presence of sugar easy in its application, and satisfactory in its indications.

1. *Hünefeld's Test**.—Place four ounces of the suspected urine in a glass exposed to the sun's rays, and add about six drops of a tolerably strong solution of chromic acid. In a few minutes, the mixture, previously orange-red, becomes brownish, and soon after assumes a bistre-brown colour, if sugar be present. These changes take place much more quickly if the

* *Journal für Practische Chemie*, vii. 42. Copied into Berzelius's *Jahresberichte für Physischen Wissenchaften*. 1837. P. 386.

mixture of urine and chromic acid be gently warmed before exposure to light.

This test depends for its action upon the deoxidizing power of the sugar, by which the chromic acid is reduced to oxide of chromium; for, after warming the mixture, the addition of a few drops of liquor potassæ, produces a copious deposit of the green oxide. As pure chromic acid is prepared with great difficulty, I endeavoured to find some preparation which might replace it, and found that, by making bichromate of potass into a paste with sulphuric acid, and boiling the magma with not quite enough water to dissolve it, a solution was obtained, which, when decanted from the crystals formed during cooling, contained enough free chromic acid, or rather of a combination of this with sulphuric acid, to exhibit all the changes with saccharine urine above described. In using this solution, enough should be added to the suspected urine to give it a full orange colour, without which the subsequent changes will not be perceptible.

There is an important objection to this test which renders all its indications liable to serious fallacy, depending upon the fact, that all urine containing a normal proportion of colouring matter deoxydizes chromic acid; and consequently urine, whether saccharine or not, will partially convert this acid into oxide. This change certainly does not occur so readily in non-saccharine urine as in a diabetic state of that fluid, but still is sufficiently marked to prevent Hünefeld's test being regarded in any other light than a fallacious one.

2. *Runge's test**. — Allow a thin layer of the suspected urine to evaporate on a white surface, as the bottom of a white plate, and, whilst warm, drop upon the surface a few drops of sulphuric acid, previously diluted with six parts of water. With healthy urine, the part touched with the acid becomes merely of a pale orange colour, from the action of the latter upon the colouring matter of the urine; whilst if sugar be present, the spot becomes deep brown, and soon black, from the decomposition of sugar by the acid, and consequent evolution of carbon. This test is stated to be so delicate, that one part of sugar dissolved in one thousand of urine can be readily detected; and even when mixed with two thousand parts, the indications are tolerably distinct.

Regarding the sources of fallacy to which this test is liable, I may mention the presence of albumen, which causes the acid to assume a tint nearly resembling that produced by sugar. There is also a peculiarity in its action, which I have more than once had occasion to observe, namely, that if the urine be evaporated so as to be capable of being drawn into threads, it scarcely produces any change of colour, on the addition of the acid, until heat is applied. It is, however, a much more trustworthy test than the last, although certainly far inferior to the following:

3. *Trommer's test.*—This, which is the latest test suggested for the detection of sugar, was proposed by Trommer, of Berlin, and received the sanction of Professor Mitscherlich. An account of it is published in Dr. Simon's *Physiologische und Pathologische Anthropochemie* †.

Add to the suspected urine contained in a large test-tube, a few drops of a solution of sulphate of copper; a very inconsiderable troubling generally results, probably from the deposition of a little phosphate of copper. Sufficient liquor potassæ should then be added to render the whole strongly alkaline; a grayish-green precipitate of hydrated oxide of copper falls, which, if sugar be present, wholly or partly redissolves in an excess of the solution of potassa, forming a blue liquid, not very unlike the blue ammo-

* Oggendorff, *Annalen*, band xxxiii., s. 431.

† Berlin. 1842. Band ii., Seite 389. Attention has been directed to this test by Dr. Jones, in the last volume of the *Medico-Chirurgical Transactions*.

niuret of copper *. On gently heating the mixture nearly to ebullition, the copper falls in the state of sub-oxide, forming a red and copious precipitate. If sugar is not present, the copper is deposited in the form of black oxide.

This test is founded on a fact long known, but not previously applied to the detection of sugar, of the power possessed by some organic matters of reducing oxide of copper, as well as some other oxides, to a lower state of oxidation. It certainly is the most delicate of all the chemical tests hitherto proposed for the detection of sugar in the urine, and will readily detect it in diabetic urine, even when very largely diluted.

It is important in using this test that no more of the solution of sulphate of copper be used than is sufficient to afford a decided precipitate on the addition of the liquor potassæ. If this precaution be not attended to, a part only of the black oxide will be reduced to red sub-oxide, unless a very large quantity of sugar is present, and thus the indications afforded by this test will be rendered indistinct.

In his remarks on this test, Simon observes, that the presence of the urea and ammoniacal constituents of the urine may, in some cases, interfere materially with its indications. To avoid this, he directs the suspected urine to be evaporated to a syrup, and digested in pure alcohol. The alcoholic solution being decanted, is agitated with dry carbonate of potash ; and on being allowed to repose, it separates into two layers, the upper consisting of the alcoholic, and the lower of the alkaline fluid. A small quantity of a solution of sulphate of copper is then added, and the whole being warmed, a yellow or yellowish-brown precipitate occurs in the lower layer, if sugar is present. I very much doubt whether this refinement of the test is ever necessary in practice, and it certainly has the objection of requiring a long time and a tedious manipulation for its completion, which is quite opposed to the character of *a test*. As directed by Trommer, his test can be applied to urine in a few minutes, and its indications are most satisfactory.

4. *Test of Fermentation.*—The development of the vinous fermentation on the addition of a little ferment or yeast to a fluid, has long been applied as a test for the detection of sugar. It was successfully employed by Professor Leopold Gmelin, of Heidelberg,† for the detection of sugar in the animal fluids after the injestion of amylaceous food. Dr. Christison has, I believe, the merit of particularly suggesting the application of fermentation for the discovery of a diabetic state of the urine.

When a little yeast is added to healthy urine, and exposed to a temperature of about 80°, no other change occurs for some time, except the development of a portion of carbonic acid mechanically entangled in the yeast. When sugar is present in the urine thus treated, it soon becomes troubled, a tolerably free disengagement of bubbles of carbonic acid takes place, and a frothy scum forms on the surface of the fluid, which evolves a vinous odour. These changes take place with great rapidity, even when the quantity of sugar present is very small. If the evolved carbonic acid is collected, the quantity of sugar in the urine may be determined by measuring it, as a cubic inch of the gas very nearly corresponds to a grain of sugar.

In certainly the great majority of specimens of diabetic urine, it is not necessary to add yeast to excite fermentation, providing a sufficient temperature be employed. This, indeed, has been stated to be the exception ; but from my own experience I can assert, that I have never yet left a glassful of diabetic urine upon a chimney-piece, when there is a fire in the grate, without having ample evidence of the development of fermentation within twenty-four hours. This test is certainly one of the best that can be employed, and is not subject to any obvious source of fallacy. It is, however, not so useful as

* Rose's *Analytical Chemistry*, by Griffin, p. 119.

† *Recherches Expérimentales sur la Digestion.* Paris. 1826. Part i., p. 202.

Trommer's, as it cannot be appealed to at the moment, and requires time for the development of its indications.

5. *Test afforded by the growth of torula.*—It is a remarkable fact, that if the smallest proportion of sugar exists in urine exposed for a few hours to a temperature above 70°, and a drop of the fluid (taken from the surface) be examined under the microscope, numerous very minute ovoid particles will be discovered. In the course of a few hours more, these become enlarged, and appear as distinct oval or egg-shaped vesicles, which soon become developed into a confervoid or fungoid vegetation, identical with that which appears in ordinary saccharine fluids, when undergoing the vinous fermentation. In hot weather I have detected the oval spores of the torula diabetis, as the organic production is termed, in diabetic urine within a few hours after its being passed; and for the last two years I have constantly relied on their appearance as the indication of the presence of sugar in urine. I can scarcely conceive an error arising from mistaking other organic particles for these spores, as the latter are always oval or ovoid, whilst all other of the organic particles developed in the urine are circular. As soon as the torula has appeared, vinous fermentation rapidly proceeds, and hence any possible inaccuracy, arising from mistaking other particles for the spores, becomes corrected.

The advantages of this test are the facility with which its indications are observed by the microscope, with an object-glass of $\frac{1}{7}$th or $\frac{1}{8}$th-inch focus, and the certainty of any possible fallacy being corrected by the subsequent development of fermentation. It is, however, less convenient than Trommer's, in consequence of the time required before its indications can be observed.

I have excluded from this list of tests that of Bourchadat*, depending upon the circular polarizing power of the urine, as it is difficult in application, requires an expensive apparatus seldom at hand, and, moreover, has its indications seriously interfered with by the colour and imperfect transparency of the urine.

I have more than once had my attention directed to the probable presence of diabetes, by observing on the patient's trowsers white spots, arising from drops of urine having dried upon them. These spots consist of minute patches of dry sugar, and are readily removed by brushing. This, although it cannot be regarded as an actual indication of the presence of sugar, is, nevertheless, useful as a leading question in investigating the patient's history.

In conclusion, I would remark, that excluding Professor Hünefeld's chromic test as too liable to fallacy to be of any practical value, the other tests, arranged according to the accuracy and convenience of their indications, may be thus placed:

1. Trommer's copper test.
2. Growth of torula.
3. Development of fermentation.
4. Runge's sulphuric test.

The profession must remain greatly indebted to Trommer for putting it in possession of a test for the presence of sugar in urine, so easy in its application, and so distinct in its indications, with the additional value of requiring but a few minutes for its employment.

Myddleton Square, Nov. 20, 1843.

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* Described in my Lecture on Urinary Deposits.—*Vide Med. Gaz.* 1843, p. 683.

ON THE ACTIVE PRINCIPLE OF THE GASTRIC JUICE.

BY M. PAYEN.

Having been supplied with gastric juice by M. Blondlot, M. Payen found the several reactions detailed in M. Blondlot's memoir exactly reproduced.

In instituting a series of comparative experiments he readily ascertained the following phenomena, under the influence of gastric juice and of a temperature of from 97° to 103° Fahr. maintained during eight hours :

1st. Cooked beef and pork (*bouilli* and ham) were so disaggregated as to be reduced by slight agitation into a pulpy substance containing a few small fibres.

2d. Isinglass was disaggregated and partially dissolved, the solution lost the power of forming jelly.

3d. Slices of skin of beef dried and cut perpendicularly to the epidermic surface became disaggregated and a great part of the cellular texture was dissolved, showing here and there detached hairs traversing the epiderm.

4th. White and transparent gelatine became liquid—it no longer formed a jelly upon cooling.

The same substances, in equal volumes, placed in water acidulated with muriatic acid so as sensibly to present the same degree of sourness, did not suffer any appreciable change after a contact during eight hours, at a temperature of from 97° to 103° Fahr. ; the muscular textures had retained their form and consistence, and the gelatine on cooling became a firm and transparent jelly.

To these plain and accordant confirmatory experiments the author was enabled to annex a direct observation as to the action of the liquid of the stomach upon a portion of compact bone ; two cylinders were prepared of equal dimensions (diameter seven millim: height $32^{mm}.1$) ; one of these enveloped in gauze, sewed and held by a thread, was introduced into the stomach of a dog. This remained in his laboratory during fifty hours ; at the end of which time the tube was opened, and by the thread attached to the cork, the cylinder was drawn out still in its envelope, but so reduced in all its dimensions, that its mean diameter was then only $4^{mm}.6$, and its height 28 millimétres ; the total weight had been reduced from 2 grammes, 780 to 1 gr., .005. Upon comparing the intact cylinder with that which had undergone a partial digestion, it was remarked that the latter had preserved its primitive solidity; the angles of the bases were rounded, the surface was striated with lines somewhat salient, corresponding no doubt to the osseous portions, of which the texture is closer. Thus it is evident that the action of the gastric juice is to disaggregate by peripheral layers the whole osseous substance, whereas, as is well known, bones immersed in dilute muriatic acid lose their calcareous salts, their organic texture being subsequently hydrated and rendered flexible and supple.

Encouraged by this last and curious verification of M. Blondlot's researches, the author was led to resume some former experiments. M. Valentin offered to repeat before M. Magendie, his attempts at artificial digestion, by means of what M. Schwann, and after him M. Mueller, termed *pepsine*. This substance ought to be present in a dilute solution of muriatic acid, which had been allowed to remain during some hours in the stomach of a calf.

The experiments were made at the College of France, a stove kept at a uniform temperature was employed, and several substances, in particular muscular texture and coagulated albumen, were submitted to the digestive liquor, comparatively with acidulated water, during twelve hours. The results being examined by MM. Magendie, Valentin, Poisseuille, Payen, and others, proved all negative — the flesh remained hard, and the fragments of albumen retained their angular forms. M. Valentin ascribed the

failure to the weakness of the acid used, and which disengaged less vapour than that employed by M. Schwann.

Proceeding upon these indications, new experiments were instituted, but nothing established in corroboration of M. Schwann's views.

Next operating with a normal gastric juice endowed with great energy, M. Payen hoped to be more fortunate, and in point of fact he succeeded in isolating a white or light amber-coloured substance, transparent, very soluble in water, easily dried, and of such activity that it can disaggregate more than three hundred times its weight of the muscular texture of beef, and that much more rapidly than the gastric juice itself. The title of *pepsine* would scarcely suit this energetic substance, since it is secreted not only when the animal is hungry, but likewise when the aliment comes to stimulate the stomach, for which reason the author names it *gastérase*..

The mode of extraction is not yet described. — *Journal de Pharmacie*, Novembre 1843, pp. 378—381.

ON THE COMPOSITION OF GASTRIC JUICE.

M. Blondlot has published some interesting researches upon the phenomena of digestion, and the composition of the gastric juice.

In order to obtain gastric juice abundantly, and in a state of great purity, the author contrived to establish a permanent artificial opening in a dog, which enabled him to penetrate directly into the stomach, and to withdraw at will either gastric juice or alimentary substances at different periods of digestion. His trials have been quite successful, and the animal upon which the first experiments were made, two years ago, is still living. Although of small size, it could furnish, at a single sitting, nearly four ounces of gastric juice.

M. Blondlot found the gastric juice constantly acid. This acidity depends neither upon lactic acid nor muriatic acid, but upon acidulous phosphate of lime. The essential acid principle of gastric juice is a peculiar organic matter, which acts after the manner of a ferment ; its chief characteristic being to operate only when an acid is present, and under the influence of a temperature of from between 50 and 104° Fahr. ; at a few degrees beyond this superior limit it loses all power.

Nutritive substances, as far as regards the action exercised upon them by the gastric juice, may be divided into two sections : some as gum, pectine, &c. are dissolved in the stomach, and absorbed by the veins ; others, as concrete albumen, fibrin, and various white textures, are softened and reduced to a highly attenuated state, in order to be absorbed by the lacteals. Fatty matters form an emulsion, which fits them for entering the lacteals.

M. Flourens submitted to the Institute the result of certain experiments in confirmation of the observations of M. Blondlot. A piece of ham, subjected to the action of the gastric juice in a vessel kept at a temperature of from 95 to 104° Fahr., was reduced, after the lapse of eight hours, to a complete state of disaggregation. Muriatic acid, under the same circumstances, produced upon flesh an effect quite different.

Lastly, M. Millot having submitted urinary calculi to the action of the above gastric juice, states, that the most part were more or less softened, eroded, or altered in texture. Nay, some which had resisted lithontripsy were so disaggregated, as to be readily crushed between the fingers, This, however, M. Leroy d'Etioles calls in question.—*Journal de Ph.*, p. 395—7.

A SIMPLE METHOD OF DETECTING FIBRES OF COTTON IN LINEN TEXTURES.

BY BOETTGER.

The methods hitherto recommended for detecting the presence of fibres of cotton in linen, consist in saturating the suspected texture with a solution of sugar and common salt, drying and then burning the threads of the weft and warp. Those fibres which on combustion leave a gray ash as residues are said to be of *flax* or *hemp*; those on the other hand which yield a black ash, are said to be of *cotton*. This test, however, is fallacious and objectionable.

A second proceeding, honoured by the prize of the "Society for the Promotion of the Industrial Arts at Carlsruhe," is the following:—A small piece is to be cut off the texture under examination; a few threads are to be then freed from the weft and warp edge, and the dressing removed by gently boiling in hot water with soapsuds or an alkaline solution. The piece of linen thus prepared is now dried with a cloth, placed in a glass tube of half an inch in diameter, and then heated over a spirit-lamp until the linen appears of a *pale yellow or straw colour*. The expansion which takes place on exposure to heat is said to cause the linen fibres (which were rather contorted in the process of spinning) to elongate in a straight direction and to approximate, the thread itself at the same time appearing thinner and more glossy; the fibres of cotton, on the other hand, which are compressed and much convolated, are said to be rendered more intricate by the heat, to appear thicker and more woolly, especially where they project beyond the texture. On careful examination I have found this test equally fallacious. A *microscopic* analysis is by no means satisfactory; not to mention the practical experience requisite in the use of this instrument. With *animal fibre* circumstances are widely different as it is readily distinguished by the microscope or even *chemically*; for nitric acid is known to produce a yellow stain on wool and on almost all animal textures; whilst cotton is not thus acted upon by the acid. We have, therefore, only to heat a small piece of a texture of cotton and wool mixed, for a few minutes, with nitric acid, wash with water and dry it between bibulous paper, when the *fibres of cotton* will be strikingly denoted by their *white colour*, and *the fibres of wool* by the *yellow discolouration*. I endeavoured to produce a similar reaction on a mixed texture of linen and cotton. Nitric acid was of course out of the question. A solution of caustic potash of the usual degree of concentration (*i. e.* one part hydrate of potash to 6.8 parts of water), and 100 other solutions of salts or acids failed; but in these experiments I observed that a caustic solution of potash was best adapted for my purpose. With this fact, I varied the strength of my reagent and found *that a solution consisting of equal parts of caustic potash and water, produced at the boiling point a well marked yellow discolouration on the linen fibre, whilst the cotton remained unchanged*, or was so slightly altered that the difference was evident, and *that I could answer for every single fibre in the texture examined.* The process is as follows:—Place one square inch of the suspected linen in a boiling mixture of *equal parts of caustic potash and water*, leave it *for two minutes*, then remove it with a glass rod from the *silver or platinum cup, press it gently without washing it in water* between a double layer of blotting paper, and detach from the weft and warp edge a few fibres. The *threads of cotton* will be immediately recognised as the *white* or *bright yellow* fibres, and *those of linen* by their *dark yellow colour*. This simple but infallible test is of course only applicable to white textures.—*Annalen der Chemie und Pharmacie*, Band xlvii., Heft 3.

ON THE FABRICATION OF PAPER MATCHES,

WHICH IGNITE WITHOUT EXPLOSION, BURN WITH A BRIGHT FLAME, AND DIFFUSE AN AGREEABLE ODOUR ; AND ON THE

PREPARATION OF LUCIFER MATCHES WITHOUT SULPHUR.

BY BOETTGER.

As the result of a very elaborate series of experiments on the formation of the cheapest and best combustible composition for lucifer matches, I gave, on a former occasion, the following recipe :—

Gum Arabic, 16 parts.
Phosphorus, 9 parts.
Nitrate of Potash, 14 parts.
Finely levigated Manganese, 16 parts.

Again called upon by the manufacturers to produce a composition with the same properties at less expense, I have come to the conclusion, that the quantity of phosphorus may be considerably reduced—that the expensive gum may be replaced by good glue—and that common jeweller's red, or red ochre, may be substituted for the red lead or manganese. I have found the following composition most advantageous :—

Phosphorus, 4 parts.
Nitrate of Potash, 10 parts.
Glue, 6 parts.
Red Lead, or Red Ochre, 5 parts.
Smalt, 2 parts.

To prepare with these ingredients an uniform mass, which will not attract moisture, and ignites without noise, it is necessary to convert the glue, by the addition of a little water, into a jelly twenty-four hours before using it, then place it in a small porcelain mortar, over a lamp, or on a stove, until the gelatine is dissolved ; add the other ingredients: first the phosphorus, then the nitre, the red lead or ochre, then the smalt, mix and rub down *with a porcelain pestle in the heated mortar, until a homogenous viscid glutinous mass is formed, the temperature, however, must never exceed* 167° *Fahr.*, for if the heat be beyond this degree, particles of the phosphorus will ignite, and if the temperature be not reduced, and the particles extinguished by pressing them into the mass, phosphoric acid will be formed, which attracts moisture from the air, and renders the composition glutinous and defective. This composition carefully prepared, may be transferred to matches or amadou, will dry in twelve hours, and is not afterwards affected by the air, especially if good glue be used. To make paper-matches which burn with a bright flame, and diffuse an agreeable odour, with this composition, it is only necessary to moisten slips of common writing-paper on either side, with a tincture of benzoin, to dry them, and paint the ends with a hair-pencil dipped in the composition. On applying friction against a rough surface, the paper will ignite without the aid or intermediation of sulphur.

To form *lucifer matches* which ignite without sulphur with this mixture, heat in a flat tin vessel as much white wax as will occupy, when melted, half one line of the vessel, take a bundle of wooden matches (as free as possible from resin) and hold them for a few seconds in contact with a red-hot iron plate, so as to carbonize their ends superficially, immerse them into the heated fluid wax, withdraw them quickly, and shake them smartly, to free them of the superfluous wax, and dip them singly into the above mentioned combustible composition. These matches will be found perfect.—*Annalen der Chemie und Pharmacie,* Band xlvii., Heft 3.

ON THE PREPARATION OF OXIDE OF CHROMIUM IN THE FORM OF ROLLED-UP TEA-LEAVES.

BY BOETTGER.

Arnold Maus appears to have first discovered that bichromate of ammonia, when slightly heated, undergoes immediate decomposition, yielding pure oxide of chromium as the residue. If the heat be suddenly increased before decomposition takes place, the process is accompanied, according to *Woehler* and *Unverdorben*, by a brilliant combustion. My attention was directed to this phenomenon by Dr. Buchner, and I investigated the subject with a view of ascertaining whether electricity was disengaged during this decomposition.

My labours in this respect were not crowned with the success I had anticipated; but I accidentally stumbled upon a very interesting experiment, which I recommend to the notice of all lecturers on Chemistry.

Prepare from crystallized chromic acid, crystallized bichromate of ammonia. For this purpose, dissolve the acid in a little water, and divide the quantity in equal parts; neutralize the first half carefully with ammonia, and add the other half of the acid; place the cup with this mixture under a glass-bell over sulphuric acid. The bichromate of ammonia will be thus obtained in one or two weeks, in the form of large dark red crystals, which, when dried on white bibulous paper, are not acted upon by the air.

If eight grains of this crystallized salt be placed in a platina or porcelain cup, and heated over a spirit-lamp, a *very energetic reaction*, accompanied by a brilliant combustion, will be observed to take place. The crystals *swell, and voluminous green masses of oxide of chromium burst forth, which bear so striking a resemblance to convoluted tea-leaves, that a connoisseur might be deceived.* If the cup be held over a porcelain plate, the product of this decomposition (the pure oxide of chromium) may be collected and sent round for inspection. I generally show this experiment when speaking of the oxide of chromium, and add a second of not less interest. Intimately mix 45 parts (by weight) of gunpowder with 240 parts of perfectly dry bichromate of potash, and 35 parts of hydrochlorate of ammonia, pulverize, and pass the whole through a very fine hair-sieve. By filling a conical wine-glass with the powder, and carefully everting it, the powder may with a little manipulation, be made to represent a cone. A small piece of lighted amadou placed upon the apex, will cause the powder to ignite, and the whole cone will burn slowly, under brilliant corruscations, to the very base. The gray-black glowing residue, dulcified with water, yields a beautiful *bright green oxide of chromium* as the result.—*Annalen der Chemie und Pharmacie*, Band xlvii., Heft 3.

ON THE BEST METHOD OF REMOVING THE STAIN PRODUCED BY CHEMICAL MARKING-INK FROM LINEN TEXTURES.

BY BOETTGER.

Nitro-muriatic acid has been recommended for this purpose; but without entering into the obvious demerits of this agent, which is neither fitted for general use nor suited for cambric or fine linen, I propose *a concentrated solution of Liebig's cyanide of potassium, as a sure and harmless means* of removing the stain of marking-ink from linen textures.

In the preparation of this salt, it is essential that the ferrocyanide be as free as possible from sulphate of potash, to prevent the generation of a com-

bination with sulphur during the process of heating, which would entirely defeat the object.

Names and marks on linen or wearing apparel, of *many years standing, may be totally and effectually removed from the finest cambric, even without the slightest injury to its texture*, by rubbing the mark gently with a rather concentrated solution of this cyanide of potassium. If a stain of common writing-ink have been used in addition, in marking the linen, a hot concentrated solution of oxalate of potash must be afterwards applied. The red and black stains produced on the skin by the solutions of the salts of silver and gold, may be perfectly removed by a solution of the abovementioned salt. It is necessary, however, to observe, that the skin should be intact, as this salt produces ill effects, if applied to open sores. — *Annalen der Chemie und Pharmacie*, Band xlvii., Heft 3.

ON IODINE AS A TEST FOR SOLANINE.

BY DR. H. BAUMANN.

It is generally known that iodine produces a brown colour with the solutions of solanine and its salts, but the author has latterly discovered, that the test, when iodine and iodide of potassium are used, cannot be considered valid without limitation, inasmuch as these substances produce analogous appearances with dilute sulphuric acid, by the formation of a small quantity of hydriodic acid, which dissolves some iodine, and thereby produces a brown colour. The presence of solanine is always distinguished by a permanently dark turbid discolouration of the solution to which these reagents are added, whereas the solution remains clear though discoloured, when there is no solanine present. The following experiments may tend to show the value of the test as used by Dr. Baumann :—

1. Iodine, sulphuric acid, and water.—No reaction.
2. Iodine and sulphuric solution of solanine.—At the bottom of the glass and surrounding the iodine, was a rusty brown precipitate, which by shaking, rendered the fluid yellow ; but the entire solution became turbid. In forty-eight hours the liquid was clearer, and at the bottom of the glass a quantity of iodide of solanine was found, which was not redissolved by the fluid.
3. Iodide of potassium and iodine of water.—The fluid became yellow, a clear brown layer found about the iodine, but was, on shaking, redissolved, forming a bright yellow clear liquid.
4. Iodide of potassium, iodine, sulphuric acid, and water.—The clear solution resembled tincture of iodine in colour.
5. Sulphuric solution of solanine, iodide of potassium, and iodine. — A brown-red discolouration took place instantly, and the fluid remained turbid.
6. Sulphuric solution of solanine (to which a little carbonate of soda was added to neutralize the acid) and iodine.—The solution remained for some time unchanged, but a rusty brown precipitate found at the bottom of the glass, which gave the solution, when shaken, a yellow colour, and rendered it turbid.
7. Sulphuric solution of solanine, carbonate of soda, iodide of potassium, and iodine.—Intense brown discolouration of the fluid, which became totally turbid. After a time a red-brown precipitate formed, but the solution remained turbid. In forty-eight hours these reactions remained the same, and we may with safety assume, that unless the solution be turbid, there can be no solanine present. This turbidity depends on the insolubility of the iodide of solanine. Direct experiments were made with this salt, which perfectly corroborated the former tests.

The iodide of solanine is a red, transparent, amorphous substance ; when dry, friable and hygroscopic, but is not otherwise changed by exposure to

the atmosphere ; it suffers a high degree of heat without undergoing decomposition—a degree far beyond the point of evaporation of iodine ; at a higher temperature, iodine is given off, leaving a carbonized mass. Heated in a glass tube, it melts, iodine escapes, and the empyreumatic portion of the solanine, and a loose coal remains. Heated in a platina spoon, the iodide of solanine melts, ignites, burns with a bright flame, and leaves an ash which can be totally dissipated.—*Arch. der Pharm.*, xxxv., p. 137—141.

ON THE DESTRUCTION OF THE CONTAGION OF THE PLAGUE.

A COMMITTEE of Russian medical authorities has been making experiments in Egypt, on the destruction of the contagion of the plague, by means of hot air. The woollen articles of clothing were worn by persons decidedly affected with the disease, for twenty-four hours, exposed to a heat of 144°—167° Fahr., in a heated room, and were then worn by persons in perfect health, who had held quarantine in disinfected clothing. These persons, fifty-six in number, wore the woollen clothing during a fortnight, and not one of them became subject to the plague for several weeks after the experiment.—*Pharmaceutische Central Blatt.* No. lxvii, 18th October, 1843, page 751.

RESEARCHES ON THE CONSTITUTION OF SALICINE.

BY M. PIRIA.

FOR several months I have been engaged in a series of new researches on salicine, with the view of elucidating the true chemical constitution of this remarkable body, and the nature of the reactions by which such various products are obtained from it. I have now the satisfaction to announce, that these questions are completely resolved.

It results from my experiments, that salicine ought to be regarded as a combination of glucose (grape-sugar) with another organic matter, which may be very easily isolated by treating the salicine with a solution of sinaptase (emulsine). After some hours of contact, the mixture is to be shaken up with some ether ; the etherous solution, which contains the new body, is to be decanted, and allowed to evaporate spontaneously ; the glucose remains dissolved in the water.

This substance, which for the present I call *saligenine*, crystallizes in large pearly tables. The per-salts of iron develope in it a fine indigo-blue colour. Weak acids, with heat, transform it into *salicetine*, without any other product —oxydizing bodies, into *hydruret of salicile*—nitric acid into *picric acid*. Concentrated sulphuric acid gives it an intense red colour.

These characters added to those of glucose, form the characters of salicine itself, just as, on combining the properties of an acid and a base, you have the properties of the salt which results.

It is known that oxydizing bodies change salicine into hydruret of salicile. But for this conversion to take place, it is necessary not only that the saligenine should lose hydrogen, but in addition, that the oxydizing agent employed should be sufficiently energetic to burn the glucose which is combined with it.

If salicine be acted upon by very weak nitric acid, and at the ordinary temperature of the air, the hydruret produced by the action of the nitric acid on the saligenine remains combined with the sugar. This combination constitues a new substance, for which I propose the name of *helicine*.

Helicine in its turn is very easily converted into hydruret of salicile and glucose, under the influence of sinaptase, of acids, and of alkalies.

In my former investigations, I analyzed a crystalline substance produced by the action of chlorine on salicine. As, in this body, the chlorine replaces an equal number of equivalents of hydrogen, it was to be presumed that it would be found to have the same chemical constitution as salicine. In fact, when this substance is boiled with weak hydrochloric acid, it is transformed into glucose, which remains dissolved, and a red product containing all the chlorine. This latter may be obtained directly, by treating saligenine with chlorine.

The following formulæ represent the compounds to which I have alluded :—

$C_{28}\ H_{16}\ O_8$	Saligenine
$C_{24}\ H_{20}\ O_{20}$	Sugar
$C_{52}\ H_{36}\ O_{28}$	Crystallized Salicine.
$C_{28}\ H_{12}\ O_8$	Hydruret of Salicile
$C_{24}\ H_{20}\ O_{20}$	Sugar
$H_3\ O_3$	
$C_{52}\ H_{35}\ O_{31}$	Helicine
$C_{28}\ H_{11}\ Cl_5\ O_8$	Saligenine treated with chlorine
$C_{24}\ H_{20}\ O_{20}$	Sugar
$C_{52}\ H_{31}\ Cl_5\ O_{28}$	Chlorosalicine.

The results of my analyses differ a little from the composition expressed by the generally received formula for saligenine. This arises probably from the alteration which this substance undergoes in crystallizing from hot water, for I have found on boiling the solution of saligenine in water, that it is transformed into a new body, which I have not yet examined. I hope to be able to remove all doubt on this subject.

On submitting salicine to the action of a stronger nitric acid, after a few days there is obtained a crystallized acid, the silver salt of which has for its formula,

$$Ag\ O + C_{14}\ H_5\ Az\ O_9.$$

which represents anilic acid with an equivalent of hydrogen.

On treating this acid with iodine, with heat, and adding to it a solution of potash, there is obtained in combination with the potash, a new acid, the composition of which, in its anhydrous state, is represented by the formula

$$C_{12}\ H_3\ Az\ I_2\ O_5.$$

This is, as will be seen, the former acid ($C_{14}\ H_5\ Az\ O_9$), which has lost two equivalents of carbonic acid, while two equivalents of iodine have replaced two equivalents of hydrogen.

These are the principal facts which have resulted from my investigations, and which I propose shortly to publish more in detail.—*Comptes Rendus.*

ON SANTONINE.

BY M. MIALHE.

Santonine is a principle *sui generis*, resembling, in a certain degree, the concrete volatile oils or *stearoptenes*, discovered about the same time, by Kahler and Alms, and investigated by the younger Trommsdorff. It exists in several species of the genus artemisia, especially in those which produce the floral summits designated in commerce as *semen-contra*.

The chemical properties of this substance are rather remarkable, it occurs in brilliant crystals, which are elongated quadrilateral tables : it is without smell, and nearly insipid, owing to its sparing solubility in water, that vehicle dissolving in the cold only a five thousandth part by weight ; what farther proves the same thing is, that the alcoholic solution has a very decided bitter taste.

Santonine though neutral to test paper, is capable of uniting with bases after the manner of acids, forming salts, many of which are soluble and crystallize. Are the eminently vermifuge propensities of semen-contra due to the santonine, or rather to the volatile oil which it contains ?

Santonine is said to possess marked vermifuge qualities in the dose of from four to six grains. But, according to M. Soubeiran, this property belongs more certainly to the essential oil of semen-contra. According to M. Calloud the elder, santonine exercises a special noxious influence upon the round worms. He has repeatedly administered it to children with remarkable success, as have also numbers of his professional brethren. If this be fully substantiated, santonine will constitute a valuable addition to infantile remedies, for being almost tasteless, it will be generally preferable to the volatile oil of semen-contra, which is so acrid, that few children can take it.

The therapeutic efficacy of this substance, which is nearly insoluble in water, may be referred to its dissolving readily in alkalies, for the liquid contained in that portion of the intestinal tube, where the parasites in question are usually situate, has a very marked alkaline reaction, which thus renders it susceptible of becoming soluble, and consequently sapid and active.

It may be remarked, that the very circumstance of santonine being soluble and capable of being absorbed only in the lower part of the alimentary canal, enhances its efficacy, since every good anthelmintic agent ought necessarily to pertain to the class of substances which are little or not at all subject to be absorbed in the stomach.

Although most Chemists regard santonine to be insipid, M. Calloud recommends mixing it with forty or forty-four parts of sugar, to induce children to swallow it more readily. Subjoined is his formula :—

Take of Santonine one drachm.
White Sugar in powder, five ounces.
Pulverized gum tragacanth, half a drachm.

Form into 144 tablets. Of these, the dose is from twelve to twenty.

The following is M. Calloud's process for obtaining santonine which is somewhat vague : sixty-six pounds of semen-contra are to be put into a large boiler, with a sufficient quantity of water, and heated to the boiling point ; milk of lime is then to be added, in quantity adequate to saturate the santonine, and to fix at the same time the greater portion of the colouring matter. It is then subjected to pressure, the marc is then placed in the boiler, and exhausted by a fresh quantity of boiling water, and afterwards submitted to pressure. The two decoctions are conjoined, and allowed to deposit. The supernatant liquor is decanted, allowed to evaporate in a very large capsule, and, at a certain pitch of concentration, clarified and strained. This done, the liquor is set upon the fire, evaporated anew to a suitable degree, then poured into a large stoneware vessel, and a slight excess of muriatic acid added. After being allowed to settle during twenty-four hours, santonine more or less pure will be found. This is to be washed with weak alcohol, whereby the greater portion of the fatty resinous matter is removed, the sediment is next expressed, treated by boiling alcohol and charcoal, and allowed to crystallize.

The acidulous muriate of lime, after standing for twenty-four hours,

still holds in suspension a certain quantity of santonine. Hence it must be allowed to deposit for some time longer, and if not fully concentrated, the excess of acid may be saturated by a fresh quantity of milk of lime, and again evaporated.—*Bulletin de Therapeutique.*

ON THE EMPLOYMENT OF COCHINEAL IN THE TREATMENT OF HOOPING-COUGH.

Dr. Cajetan Wachtl, of Vienna, treated nine children, suffering from hooping-cough, with cochineal, as recommended by certain English physicians. The remedy was administered in all stages of the disease; and its efficacy was so instantaneous and constant, that notwithstanding the paucity of cases, Dr. Wachtl feels authorized to regard cochineal as a specific in hooping-cough. The following is his manner of exhibiting the remedy:

Take of Cochineal, one scruple.
Sugar, one ounce.

Dissolve in six ounces of warm water. The dose is three teaspoonfuls in the twenty-four hours.

The solution ought not to be kept longer than thirty-six or forty-eight hours, because after that time it assumes a brown hue, and a sour taste, which renders it unfit for use.

ON THE CAUSE OF THE FREQUENT FAILURE OF THE IGNITION OF HYDROGEN GAS BY SPONGY PLATINUM, IN DOBEREINER'S INSTANTANEOUS LIGHT APPARATUS, AND ITS REMEDY.

BY BOETTGER.

The two gases which act most perniciously on spongy platinum, are ammonia and sulphuretted hydrogen. *Nordhausen sulphuric acid*, when diluted with water, generates, without exception, sulphurous acid, which is converted by the development of hydrogen (from the zinc) into sulphuretted hydrogen, and destroys the platinum in Doebereiner's machines. *English sulphuric acid* does not appear to form sulphurous acid when diluted, and is, therefore, better adapted for filling these machines, and experience has shown that spongy platinum will act better, and for a longer time, where the latter variety of acid is used. By Marsh's apparatus, the truth of this assertion may be readily proved.—*Annalen der Chemie und Pharmacie*, Band xlvii, Heft 3.

A FEW REMARKS ON NICKELIZING AND PLATINIZING METALS BY THE GALVANIC PROCESS.

BY BOETTGER.

Although the labours of Messrs. Elkington and Ruolz have greatly furthered the advancement of galvanoplastics and galvanography, much is yet left undiscovered in this practical branch of Chemistry; and no salts are yet known which are well adapted for nickelizing and platinizing metals. The cyanide of nickel and potassium, advised for this purpose by Ruolz, is as defective as the salt of platina which he recommends.

After many futile experiments, I have found no salt of nickel to answer

the purpose as well as the sulphate of the protoxide of nickel and ammonia, especially for coating copper and brass with the metal.

To obtain the salt of nickel in question, dissolve the common nickel of commerce in nitric acid, pass a stream of sulphuretted hydrogen through the solution, to remove any of the copper and arsenic; precipitate the filtered solution by carbonate of soda; dissolve the washed carbonate of the protoxide of nickel in dilute sulphuric acid, and place it under a glass-bell over sulphuric acid, to crystallize; pulverize the dry crystals, and add to the powder (in a bottle) as much fluid ammonia as is necessary to dissolve it. Thus a beautiful dark blue fluid is obtained ready for use.

Copper-plate *assumes a silvery-white shining surface*, after exposure to a long-continued and constant galvanic action in this solution. I have thus covered a plate of copper so completely in half an hour, that it brought a magnetic needle, suspended by a thread of raw silk, out of the meridian. A drop of concentrated nitric acid, placed on the coating of nickel, gave no evidence of reaction on the metal below it; whilst copper-plate, covered with gold in the same space of time, is strongly acted upon by the acid. As pure nickel is as difficult to melt as iridium and manganium, and is, in fact, not to be fused except by the oxy-hydrogen blowpipe, this metal procured in the pure state in form of plate, by means of galvanism, might be used in the arts for the formation of magnetic needles, &c.

For platinizing copper and brass, Ruolz recommends a solution of chloride of platinum and potassium in a solution of caustic potash; but Petzhold has remarked, that he did not find this solution to answer, and I have made the same observation. It will be remembered, that I made known, a few years ago, that copper and brass might be covered with a thin coating of platinum, by boiling the plate of clean metal in water, in which one part of platinate of ammonia and eight parts of hydrochlorate of ammonia were dissolved. Metallic articles thus treated, are covered in a few seconds with a coating of platinum, but not sufficiently thick to resist the action of acids.

If *the galvanic influence* be now resorted to, to produce a thicker coating, the articles are covered by a black oxide at the negative electrode, and the experiment fails. The same effect was produced with a soda solution of chloride of platinum, and I could in fact never obtain a perfect metallic shining coating of platinum. Other salts of this metal were not more successful, and I did not arrive at the desired object, except with a *solution of common chloride of platinum and chloride of ammonium* at the boiling point, to which were added *a few drops of solution of ammonia* in a moderately heated state. Chloride of ammonium and platinum is not very soluble in water at an ordinary temperature, but much more soluble in boiling water. If a few drops of liquor ammoniæ be added to the solution (after it has slightly cooled), and the mixture be subjected to the action of a constant battery, the platinum will be thrown down at the negative electrode in the metallic form. I thus succeeded in platinizing a copper cup, in which I was able to boil concentrated nitric acid without affecting the copper which was beneath the platinum coating. The only objection to this process is, that this solution of platinum contains very little metal, and it therefore becomes necessary to replace the exhausted solution (for it is soon deprived of its metal) frequently by fresh fluid.—*Annalen der Chemie und Pharmacie*, Band xlvii., Heft 3.

ON THE CITRATES OF THE PROTOXIDE AND PEROXIDE OF IRON.

BY W. HELDH.

Citrate of Protoxide of Iron.—Metallic iron, whose surface is free from oxide, is dissolved by dilute citric acid, with the development of hydrogen

gas. A saturated solution has a yellow tinge, and on the addition of alcohol, a white flocculent precipitate is formed, which is the citrate of the protoxide of iron. By standing, it becomes brown and shrivels.

Citrate of Peroxide of Iron.—Newly precipitated hydrated peroxide of iron dissolves when heated with citric acid, and forms a reddish-brown sweetish fluid, from which alcohol precipitates a reddish-brown neutral salt. The aqueous solution forms a precipitate with the caustic alkalies and their carbonates, also with the ferrocyanide of potassium. The solution, on evaporation, assumes the consistence of syrup, and may be dried in a water-bath. When dry, it presents itself as thin light brown plates, with a metallic lustre, which, on being removed from the sides of the vessel, split into a number of transparent shining lamellæ. In this form the salt is met with in commerce in England, where it is used for medicinal purposes. Bibasic citrate of soda dissolves recently precipitated hydrated peroxide of iron, yielding a red brown solution, which dries in the form of a dark-brown mass, with a metallic lustre: it absorbs water from the atmosphere, then becomes turbid, and gradually deliquesces. Liebig brought a series of the double salts of the peroxide of iron from London, prepared by Mr. Bulloek, by drying the aqueous solution, when evaporated to the consistence of syrup, in thin layers on glass or porcelain plates, at a temperature of 212° Fahr.—*Pharmaceutisches Central Blatt*, Nov. 22d, 1843, p. 53.

REVIEW.

TABLES OF THE CHARACTERISTICS OF CHEMICAL SUBSTANCES, *adapted to facilitate Chemical Analysis.* By SIMEON SHAW, LL.D. Author of "*The Chemistry of Pottery and Glass*," "*Nature Displayed*," *&c. Sherwood, Gilbert, and Piper.*

WE quite agree with the author of these tables, that "accurate knowledge of the characteristics of substances is most advantageous to the votaries of Chemistry." For such knowledge to be rendered useful to the student, however, it should be conveyed in an easily intelligible style, in a language and form consistent with those adopted by the best chemical writers, and above all it should be free from errors. If we test Mr. Shaw's work, with reference to these qualifications, it will be found very deficient. The style is quaint, and often unintelligible. The following is a fair specimen:—

"Solution of lime is indifferent to bicarbonate of soda, and to hydrofluosilicic acid, but neutral solution supplies a *white* precipitate to oxalates, *crystalline* (as gypsum), in concentrated, to sulphuric acid and sulphates, in dilute, to binoxalate of potash, indifferent to water, also to oxalic acid; but appropriated by plus of nitric or muriatic acid. The precipitated carbonate is appropriated by plus of carbonic acid."

Among the symbols, Z. is used for nitrogen, BM. for bromine, N. for sodium, Mr. for mercury.

The atomic weights of the substances are given with reference to hydrogen, which is represented as .25. Oxygen is made 4.; sulphur, 4.; carbon, 3.; nitrogen, 3.5.

Iodine is described in the table as a "gas;" in the observations

which follow, as "black," "crystalline." Sulphur is described as a gas. "Nitric acid," an "orange gas," symbol "ZO_5," the atomic weight of oxygen being the same as that of sulphur, and sixteen times that of hydrogen. "Aqua fortis" is a "yellow liquid," symbol ZHO_3. Phosphorus, a "yellow gas."

These few extracts will be quite sufficient to show that what is true in Mr. Shaw's tables, can only be understood by those already conversant with the facts; while that which is erroneous, constitutes so large a proportion of the work, as to render it worse than useless.

THE SALE OF SPIRITS OF WINE.

On Thursday, the 21st of December, a deputation, consisting of the Vice-president, Mr. Savory, Mr. Ince, Mr. Morson, and Mr. Bell, had the honour of an interview with the Chancellor of the Exchequer on this subject: as the Report could not be officially laid before the Council in time for publication in this number, it is deferred until next month.

TO CORRESPONDENTS.

"A Country Member" (*omitted last month*).—

We have not leisure to repeat the process of the Dublin Pharmacopœia for the satisfaction of our correspondent. Dr. Barker, the Professor of Chemistry in Trinity College, is, or ought to be, an authority on the question since on him "devolved the task of arranging the materials and making the requisite experiments for the Pharmacopœia." Moreover, Dr. Kane tells us, that at Apothecaries' Hall, Dublin, the hydrocyanic acid is prepared of the strength of 1.6 per cent. of real acid, and sp. gr. 0.998, which is that of "the standard strength of the Dublin Pharmacopœia." It is obvious, therefore, that both the preparer of the Pharmacopœia and the Professor of Chemistry to the Apothecaries' Hall, Dublin, regard the proper strength as 1.6 per cent. of real acid. The process of the Dublin Pharmacopœia is, however, capable of yielding a stronger acid. One ounce (=480 grs.) of bicyanide of mercury is used in the preparation of eight ounces *by measure* of liquid acid, sp. gr. 0.998. Now one equivalent or 254 parts of bicyanide of mercury are capable of yielding two equivalents or 54 parts of real hydrocyanic acid. Hence 480 grains of the bicyanide yield about 102 grains of real acid. Eight ounces of diluted acid, sp. gr. 0.998, weigh 3832.32 grains. So that 3832.32 grains of prussic acid, prepared according to the Dublin Pharmacopœia, cannot contain more than about 102 grains of real acid, equal to 2.66 per cent.; which, therefore, ought to be the strength of the product, supposing no loss to be suffered in the process.

"Bruce."—(1.) We have seen no published formula for *Infusum Taraxaci*; if ordered in a prescription, we should conclude that *decoction* was intended, unless a definite formula were given. (2.) *Turpeth* (or *turbith*) *mineral* is the *yellow subsulphate of mercury*. (3.) The modern name for "Ferri Carbonas præcip." is *Ferri sesquioxidum*. For the process see the Pharmacopœia. (4.) Ferri Rubigo is anhydrous "sesquioxide" of iron. The Dublin Pharmacopœia orders it to be prepared by moistening pure iron wire with water, and exposing it to the air until it is corroded with rust. (5.) We are unable to state the cost of Parker's burning lens.

"EGOMET" (Ingatestone).—(1.) The dark colour sometimes observed in red precipitate ointment, arises from the oxidation of the fat at the expense of the peroxide of mercury. (2.) We have never attempted to powder balsam of tolu.

CONCENTRATED SYRUP OF SENNA.—We have received a communication from Mr. Freeman, in reference to the letter in our last number, in which Messrs. Smith claim priority over Messrs. Duncan in the introduction of their respective "Concentrated Essences of Senna." Mr. Freeman states, that the above preparations are both founded upon, and date their origin subsequently to, his Concentrated Syrup of Senna, which was devised by him in 1838, made known to the profession in London in 1839, and sold in Edinburgh in 1840. We are also informed that Mr. Coleby introduced a similar preparation, about ten or twelve years ago, which he borrowed from some other person who has not yet put in his claim. It is probable that by a little research, the rise and progress of this preparation might be traced even as far back as the days of Culpepper or Quincy; and we feel bound, as a matter of justice, to recognise the claims of each "inventor." But we think future communications on this subject would be more adapted for the cover of this Journal than for the body of the work.

AN ASSOCIATE.—We have already published a formula for GINGER BEER. See vol. ii., page 778.

R. G. M.—(1.) The sample of unguentum hydrargyri nitratis, although slightly discoloured, appears in other respects to be very good. We believe it is impossible entirely to guard against discolouration by keeping, and dilution with other ointments. (2.) In reply to the following remark in Rennie's Dispensatory, quoted by R. G. M.: "I should have thought Mr. Brande understood Chemistry better than to prescribe plumbi acetas with rose water!!" [We have only to observe, we should have thought Mr. Rennie understood Chemistry better than to confound rose water with infusion of roses, which he has evidently done in this case.]

E. B., M. P. S. ought to read his Pharmacopœia.

M. P. S. (Hull) appears to have mistaken chloride of lime for chloride of calcium.

"PHARMACIEN" (Liverpool).—We believe that the *air-pump* is almost universally used, for obtaining a vacuum in the apparatus for preparing extracts *in vacuo*.

"EXTRACT."—Hooper's Medical Dictionary, price £1 10*s*.

℥j.—Nux vomica is sometimes called "crowfig," or "crows'-eyes."

We received the description of Mr. Buckle's vessel for preserving leeches too late for insertion this month; and must therefore, in the mean time, refer our readers to the advertisement on the cover.

ÆQ. D.—(1.) We are not acquainted with any recognised formula for unguentum cretæ comp., except the unguentum plumbi comp., P. L. (2.) See vol. ii., page 148. (3.) Yes. (4.) The subject is not within our province. (5.) We should think the deposit alluded to should be removed by mechanical, not chemical, means.

A. P. S. (Newcastle).—We are not acquainted with any method which we could recommend for depriving rancid castor oil of its taste and smell.

W. W. M. (Bath.)—The question could not be answered without a careful analysis of the substance, which we can scarcely be expected to undertake.

F. W.—A person in business on his own account cannot continue to be an Associate.

Mr. Burgess suggests the establishment of a society similar to the Sydenham, for the publication of works on Pharmacy at a cheap rate. [Our Correspondent forgets that the copyright of such works is private property.]

J. G. (Bath) states, that some medical men in Bath frequently order "Confectio ferri comp," which is made only by a certain Chemist. J. G. wishes to obtain the formula, "that all may stand a fair chance." [If the Chemist alluded to will send us the formula, we shall be happy to publish it, we have no other means of obtaining the information.]

E. B.—The French periodicals may be obtained of Bailliere, Regent Street; Dulau, Soho Square, and other dealers in foreign works.

T. H.—An Associate who voluntarily submits to be examined for his Diploma as a Member, could not, if rejected, claim it on the ground that he had joined the Society before July 1, 1842.

"A Founder" inquires (1.) whether a preparation called "*Dandelion Coffee*, strongly recommended by the most eminent of the Faculty, in preference to the heating properties of Coffee and Tea, as a most wholesome and agreeable breakfast beverage in all bilious and liver complaints, and affections of the viscera (prepared by a peculiar process)," is subject to the Coffee licence, or a medicine stamp. [We think the preparation is "between Scylla and Charybdis," but may possibly escape both.] (2). We have understood that Cayenne pepper is, according to the letter of the law, included in the term *pepper*, in reference to the licence.

"A Young Chemist" inquires, how the marks made by sailors on their hands or arms can be removed? [These marks are generally made by means of gunpowder introduced under the cuticle, and they are indelible, except by excision, which would leave a scar].

W. B. (Barnstaple) wishes for a formula for making Anchovy paste.

Frater" requires a formula for *varnish, for patent leather boots*; also a soothing syrup for children during dentition. [Perhaps some of our readers can furnish the former. The latter is a dangerous remedy, which we dare not recommend without medical advice.]

"A Correspondent" (Tavistock), wishes to find a good preparation for the backs of paper labels. A solution of two parts of common gum arabic or senegal, with one part of sugar, is sometimes used; we have been informed that *dextrine* or British gum answers the purpose better.

M. P. S. (City), thinks it very desirable that a standard preparation of fluid extract of sarsaparilla should be introduced by authority, as much inconvenience arises from the want of uniformity in the strength of the preparations sold under that name. [We concur in this opinion.]

J. W. W. inquires, whether it is likely that a Branch School of Pharmacy will be established in Leeds? [Branch Schools are likely to spring up in localities where a demand, and facilities exist; we have no means of ascertaining whether this be the case in Leeds.]

J. W. (Liverpool) states, that many Associates are desirous for the establishment of a School of Pharmacy in that city; and suggests the propriety of taking some active steps for this purpose. [We recommend our Correspondent to consult the local secretary, Mr. G. Thompson, on the subject. Such proceedings ought to emanate from the members of the locality, who should communicate with the Council when they have a definite plan to propose.]

W. H. R. (Plymouth).—(1.) Pure chlorine. (2.) We are not acquainted with the work alluded to.

"CURA" inquires, whether the books in the Library of the Society can be borrowed, and alludes to the difficulty of taking advantage of them while they remain on the shelves in Bloomsbury Square. [It has not been decided to form a circulating library. For this purpose several duplicates of the books most in demand would be necessary, and the collection is not sufficiently extensive at present.]

M. S. H.—For information on the electrotype process, we must refer our Correspondent to Mr. Smee's work on the subject.

"A LONDON ASSOCIATE."—Phillips's translation of the London Pharmacopœia.

A. P. S. (Norwich).—Common soft soap is made with fish oil, tallow, and potash. A more pure kind is ordered to be prepared for medicinal purposes with olive oil and potash. The process for making soaps is described in most works on Chemistry.

A. P. S.—It is contrary to the laws of the PHARMACEUTICAL SOCIETY for Members to practise Medicine and Surgery, whether in this country or abroad. We are unable to state the amount of salary given to Assistants in India.

"VINDEX," in reference to the article in our last number, on "Remuneration for Labour," alludes to the hardships, privations, and inadequate salaries of Assistants; the difficulty of acquiring a scientific knowledge of their business; the injury which their health often sustains from close application, observing, that the subject claims the attention of the PHARMACEUTICAL SOCIETY. [We admit that there are some grounds for these complaints; and our remarks, in page 270, are intended to apply to the Chemist in every stage of his progress, from his becoming an apprentice until after he has embarked in business for himself. Assistants are in a state of probation, through which their employers have passed; and although the period of servitude varies in duration, according to the circumstances and talents of each individual, all must pass through it. We hope the time will arrive when the hardships alluded to will be diminished; and have no doubt that the next generation of Assistants will derive benefit from the exertions which are now in progress to raise the character and amend the regulations of one branch of the profession.

Mr. PAIN.—The arrangements respecting Fees on Apprenticeship, and the amount of advantages to be granted to Apprentices, being optional between the parties concerned, a society could not exercise any controul over these matters. We shall probably have occasion to offer a few general remarks on this subject at a future time.

"A CORRESPONDENT" (Northampton) has sent us the shopbill of a person who styles himself a *Prescribing Druggist*, and states, that "Diseases of every kind are skilfully and judiciously treated." The list of "infallible remedies," "sure cures," and "delicious drinks," is amusing. The author of this curious document is not a Member of the PHARMACEUTICAL SOCIETY.

J. S. and W. C. are referred to the notice inside the cover of this Journal, also to a notice in the same part of our last number.

K. L. I.—See vol. ii., No. 8, and page 339 of this number; and study the Pharmacopœia.

Advertisements to Mr. CHURCHILL, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. SMITH, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. VIII.—FEBRUARY 1st, 1844.

THE SALE OF SPIRITS OF WINE.

We reported in our number for October, that the Council, in order, if possible, to arrive at a more definite and satisfactory understanding respecting the actual state of the intricate laws on this subject, had determined to take Counsel's opinion. Mr. Serjeant Talfourd, the standing Counsel of the Society, being out of town at the time, the case was laid before Mr. Hill, the tenor of whose opinion did not support the right of Chemists, according to the letter of the law, to *sell* spirits, while it left the question, in reference to the intention and object of the acts, sufficiently open to admit of litigation. On the return of Mr. Serjeant Talfourd, it was thought desirable to apply to that gentleman for his opinion on the points at issue, and also for advice as to the course which ought to be pursued.

The opinion of Mr. Serjeant Talfourd contained a very clear and complete elucidation of the bearing of the several Acts of Parliament on the subject, and was no less conclusive than that of Mr. Hill, as to the illegality of selling spirits, under any circumstances, without a licence, according to the letter of the statutes. It concluded by a recommendation to adopt measures for obtaining, if possible, an alteration in the law, as the only means of relieving the Chemists from the annoyance to which they are at present liable.

The Council accordingly appointed a deputation to confer with the Government on this subject, and the official report of the conference which took place will be found in the following pages.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

THE DEPUTATION
APPOINTED BY THE COUNCIL TO CONFER WITH THE GOVERNMENT
ON THE SALE OF SPIRITS OF WINE,

REPORT:

THAT an official application was made to the President of the Board of Trade, requesting that he would grant them the favour of an interview. The President of the Board of Trade sent an immediate reply, recommending an application to the Lords of the Treasury, who, on receipt of the communication from the Secretary, referred the question to the Chancellor of the Exchequer.

On Thursday, the 21st of December, the Deputation had the honour of an interview with the Chancellor of the Exchequer, in the presence of the Chairman of the Board of Excise, by whom they were courteously received. The Vice-President having described the present difficulties and annoyance to which the members of the trade are exposed, and respectfully requested that the subject might be taken into consideration, with a view of introducing some alteration in the laws, which might remedy the evil, the Chancellor of the Exchequer observed, that the question was involved in much difficulty. It had always been the object of the Legislature to place the sale of spirits under such regulations, that its sale, as a beverage, should be restricted rigidly to those who are licensed retailers; and however desirable it might be to enable the Chemists to sell it, in certain cases which appeared to come within their province, the privilege, if granted, would be liable to abuse, since any person calling himself a Chemist, might, if he thought proper, become a retailer of intoxicating beverages, which, although the same might not be drunk on the premises, would be injurious to those persons who are duly licensed, and would also be calculated to frustrate the general measures of the government in restraining intemperance. He also intimated that a similar application had been made to him by the Oilmen, who equally considered it a hardship that they were interdicted from selling spirits of wine, while obliged, in the course of trade, to supply the public with articles used with it for domestic purposes; so that another great door of probable abuse must be opened, if, while conceding the privilege to the Chemists, the Legislature were urged to grant it also to the Oilmen.

It was respectfully suggested by the Deputation, that the rectified spirit required and sold by Chemists, was not adapted for use as a beverage—that it was not generally kept or sold by licensed victuallers, who appear indifferent on the subject—that the Chemists were desirous of selling it, not so much on account of the profit to be derived from its sale, which is very trifling, but as a matter of necessity; and that the sale being restricted to a limited quantity, and from being consumed on the premises under suitable penalties, any abuse of the permission might be prevented; besides which, they conceived the case of the Chemists very different from that of the Oilmen, inasmuch as the former were absolutely compelled to keep the article as a Medicine, and also for Chemical and Scientific purposes. If, too, the Government objected to throw open the privilege to the trade generally, the Deputation said, that they appeared there as the representatives of the Pharmaceutical Society, and without presuming to dictate the extent to which the permission might be granted, they solicited the boon on behalf of their constituents.

The Chancellor of the Exchequer seemed still to object to the sale of spirits of wine in *small quantities*, as the very thing most open to abuse; and stated, that in consequence of the very general opposition manifested to the Bill introduced in the House of Commons, and passed by them, for the "Sale of Liqueurs in Quart Bottles only," it had been thrown out by the House of Lords. Neither did he unequivocally acknowledge the justice of the remark made, that more harm might accrue to public morals by the necessity of sending servants to the ginshop for spirits of wine, rather than allow it to be procured from the Chemist, although he admitted that the substitution of gin for spirits of wine in cleaning plate was decidedly objectionable.

Reference was then made by the Deputation to the opinion advanced by the Board of Excise, that a good deal of spirits of wine which had never paid duty was consumed by Chemists and Druggists; and it was shown that such spirit was not fit for sale in its unmixed state, while there was no doubt much had been consumed by the cheap manufacturers of ether and sweet spirits of nitre—a fact with which the Excise are very well acquainted. The Deputation also took occasion to assure the Chancellor of the Exchequer of their unfeigned desire to obtain merely the sale of spirits of wine properly rectified and duly permitted from the Distiller.

The Chairman of the Board of Excise stated, that, with regard to the informations recently laid, it had been the desire of the Board to exercise the power it possessed, with discretion and a due allowance for the circumstances of each particular case: that of the very numerous informations which had been laid (and all of

which had come under his personal cognizance), a very small proportion had been acted upon; and in every case in which it could be shown that the vendor believed it to be required for any medicinal purpose, the information had been quashed. Although, therefore, the Excise possessed the power of enforcing the penalty in every case, the Board exercised such discretion in the matter as, the Chairman contended, ought to be considered a sufficient protection to the Chemists and Druggists; and as every charge was decided on its own merits, the ground of each was carefully ascertained, and reference made to the customary nature of the business as well as character of the party implicated.

It was respectfully submitted by the Deputation, that this state of the law was by no means satisfactory, since it exposed individuals, especially those residing in country towns or remote districts, to various annoyances from the officious interference of excisemen and others; and that, although the Board might be desirous of acting with the greatest fairness and leniency, it was impossible to control the inferior officers employed, in such a manner as to prevent the occasional, if not frequent exercise of arbitrary power in an unjust manner, in individual cases in which the Board would have no means of acquiring a knowledge of the facts, except through the parties acting as accusers. The Chancellor of the Exchequer said, that it was impossible entirely to prevent improper conduct on the part of individuals while it was by no means the wish of the Government to press any of the Revenue Laws to an undue and oppressive extent; and the Chairman of the Board of Excise declared, that in the present instance, informations could only be received from an Excise officer, and in the event of an abuse of his authority being discovered, he would certainly be reprimanded, if not discharged.

A brief Memorial embodying the prayer of the Council, was then placed in the hands of the Chancellor of the Exchequer, who said that he would give the subject his serious attention.

On a review of the whole interview, the Deputation would observe, that the Government seem to object to the relaxation of the existing statutes, unless some means could be devised for preserving the main principle and intention of the Legislature in making from time to time the various laws which regulate the sale of spirituous liquors—means which it seems very difficult to suggest, inasmuch as the expense of a Licence specially granted for the purpose, or any supervision from the Excise, would be very objectionable, as was stated by the Deputation. At the same time it is clear, that while at present no indulgence will be exercised in the permission to sell spirits of wine for indiscriminate use, there is no desire on the part of the Board of Excise to deprive the public of the power to obtain it from the Chemist and Druggist, when it is *clearly and unequivocally* required for the alleviation

of any bodily ailment or disease: and the Deputation are not without hope that some advantage may possibly arise from the steps the Council have taken.

[The Council, in presenting this Report to the Members at large, regret that their endeavours have not been attended with a more decided result; while they trust that the subject has been brought before the notice of the Government, in a manner calculated to engage its serious consideration. In the mean time, they are anxious to impress upon the Members the necessity of instructing their Assistants not to furnish Spirits of Wine to their customers, unless for absolute medical use.]

On Wednesday evening, the 27th of December, was delivered a

LECTURE
ON THE PREPARATION OF ETHERS.

BY MR. REDWOOD.

He stated that the subject of the lecture was intended to comprehend, some of the practical details connected with the preparation of those ethers which are used in medicine, together with a description of their chemical compositions, and of the nature of the reactions which are supposed to take place during their formation.

"There are four kinds of ether kept by the Pharmaceutist for medicinal use; namely, ether (properly so called, but commonly called sulphuric ether), nitrous or hyponitrous ether, acetic ether, and hydrochloric (commonly called chloric) ether.

"These are all derived, as regards their leading characters, from the same source, that is alcohol; and the three last named, owe their distinguishing characteristics to certain acids, or the products of the decomposition of acids, employed in their preparation."

The composition of these ethers was explained together with that of alcohol, and it was shown that (sulphuric) ether bears a more simple relation to alcohol, in composition, than either of the others; for which reason it was selected as the first to be described.

A brief sketch of the history of the introduction of ether, as a chemical and medicinal agent, was given. The lecturer stated, that it would probably be interesting to many present to know, that the Chemist who first manufactured ether on anything like a commercial scale, was Mr. Godfrey, the founder of the house of Godfrey and Cooke, of Southampton Street. A formula for the preparation of ether had been published so far back as the year 1540; and allusion was made to the same product, in chemical

writings even before this time; but very little attention was directed to it until the publication of a paper on the subject in the *Philosophical Transactions* for 1730, by Dr. Frobenius, a German. This Dr. Frobenius and Mr. Godfrey * had been engaged as operators in Mr. Boyle's laboratory, where several experiments were performed on the preparation and properties of ether, by Mr. Boyle and Sir Isaac Newton. These distinguished philosophers, however, had not succeeded in obtaining ether, excepting in small quantity, as they had used *equal volumes* of oil of vitriol and spirit of wine for its production. In Dr. Frobenius's paper, already alluded to, the process then adopted for the preparation of ether is not described; but a note is appended to this paper, by Mr. Godfrey, stating that it was made in his laboratory, from whence it could be obtained in any quantity. About eleven years afterwards, several communications having been sent by Chemists from Paris, Germany, Italy, and elsewhere, requesting information as to the details of the process recommended by Dr. Frobenius, "*Abstracts of the original papers communicated to the Royal Society by* SIGISMOND AUGUSTUS FROBENIUS, M.D., *concerning his* SPIRITUS VINI ÆTHEREUS, *collected by* C. MORTIMER, M.D., *Secretary to the Royal Society*," were published in the *Philosophical Transactions* for 1741, and these contain a full account of the process. Equal parts *by weight* of oil of vitriol and highly rectified spirit of wine, are directed to be distilled, until a dense liquid begins to pass over; when the process is to be stopped, the distilled liquor removed from the receiver, and when the contents of the retort have cooled, half as much more spirit as that originally used, is to be added, and the distillation again continued. This addition of more spirit and renewal of the process, is directed to be repeated as long as any ether is produced. Directions are also given for the rectification of the distilled product.

"The process adopted by the manufacturer even at the present day, differs not materially from this."

The lecturer now proceeded to describe some of the leading properties of ether, and then passed to the consideration of its composition, and the supposed relation which it bears to alcohol, the latter being viewed as a hydrate of ether.

The process of etherification consisting essentially in the separation of ether from water, or the elements of water, with which it is chemically combined in the state of alcohol, it had been supposed by many, that the action of the oil of vitriol employed in the process, depended solely on its hygrometric property.

* Mr. Godfrey's real name was Godfrey Hankwitz, but on entering into business, he dropped the latter name as sounding too exotic.

The error of this opinion was pointed out. Some of the leading phenomena which ensue on the distillation of mixtures of oil of vitriol and spirit of wine, were explained and exemplified, the nature of the product being shown to vary according to the proportions of the ingredients, and the heat applied during the process. The temperature most conducive to the production of ether, was stated to be 280°, a point which appeared not to vary according to the pressure of the atmosphere, as it was stated, on the authority of Kuhlmann, that if a mixture of equal parts of oil of vitriol and spirit of wine (such a mixture as, under ordinary circumstances, produces ether on being boiled), be boiled *in vacuo* (when of course the ebullition takes place at a much lower temperature), no ether is produced, but spirit of wine.

The proportions of the ingredients, and the heat necessary for the production of ether, being determined, the nature of the reactions which are supposed to take place on mixing the ingredients, and Mr. Hennel's important investigations on this subject, were described, and to these were referred the adoption of new views, with regard to the constitution of ether and its combinations. According to these views, ether was considered to be the oxide of an hypothetical radical, called ethule or ethyl; and the compound ethers were salts, consisting of ethule or its oxide in combination with a salt radical or acid.

The continuous process for the preparation of ether was now explained in accordance with the views already developed; and a small apparatus fitted up on these principles being in active operation on the lecture-table, a considerable quantity of ether was produced during the course of the lecture.

The lecturer next alluded to the preparation of nitrous or hyponitrous ether. The complicated nature of the reactions which take place during the formation of this ether in the usual way, by distilling nitric acid and spirit of wine, was explained by a diagram; the loss sustained, in consequence of the deoxidation of the nitric acid at the expense of a part of the spirit, was pointed out; and the advantage of the process recommended by Professor Liebig, was strongly insisted on. An apparatus fitted up for the production of nitrous ether by this process, was put into operation.

The time admitted only of a brief allusion to the methods of obtaining acetic ether and hydrochloric ether.

PHARMACEUTICAL MEETING,

JANUARY 10th, 1844.

MR. PAYNE, VICE-PRESIDENT, IN THE CHAIR.

THE VICE-PRESIDENT'S ADDRESS.

I SHOULD be guilty of a great dereliction of duty, and sadly wanting in respect to departed excellence, if I were to assume the chair this evening without taking some especial notice of the melancholy event which has occurred since we last had the pleasure of meeting, and of which you are all, most probably, by this time informed—I allude to the decease of our late venerable and venerated President, WILLIAM ALLEN. I should, at the same time, be equally far from showing real respect towards the memory of such a man, if I were to indulge in anything like an elaborate eulogium on his character and worth. They need no praise of mine; but are known, and I trust appreciated, through every region of the earth, where the energies of British benevolence have been extended for the relief of suffering humanity.

My wish, in an assembly like the present, is merely to give a slight sketch—and it can be but a very slight one—of his career, as it stands connected with those scientific objects for which our Society is, in a great measure, instituted; and to touch hastily upon a few leading particulars of his professional education and pursuits, which, while they exhibit the talents and assiduity of our lamented friend, are, I think, calculated to encourage us all to imitate his example, and may in an especial manner serve as a stimulus to our younger brethren, in aiming at a like standing in our own particular department of the profession, which is alone attainable by the exhibition of real principle, sound knowledge, suavity of manners, and unwearied diligence.

WILLIAM ALLEN was the son of Job Allen, an exemplary member of the Society of Friends, and a silk manufacturer in Spitalfields; and was born on the 29th of August, 1770. It was his father's intention to have brought him up to his own business; but having shown, while at home with his parents, a taste for chemical and other pursuits connected with medicine, he was placed in the establishment at Plough Court, then belonging to the late Joseph Gurney Bevan, under whose able care William Allen first acquired a practical knowledge of Chemistry, and whom he eventually succeeded in the concern; and here, as evincing his thirst for knowledge, and his industry in the pursuit of it, I may mention, that he was accustomed to rise at four or five o'clock in the morning, and sedulously apply himself to study, the usual hours of business being fully occupied. This habit of early rising

continued to abide with him through life. He afterwards attended the several courses of lectures at the Borough Hospitals on the various subjects connected with his profession.

Shortly after he came into the concern at Plough Court he was joined by his friend Luke Howard—the firm being Allen and Howard, well known at that time as one of the few houses where chemical re-agents could be procured ; they together established the laboratory at Plaistow, which, at the expiration of the partnership, was conducted by Luke Howard, William Allen retaining the town business.

I am unable to state precisely the date of his earliest connexion, as a public lecturer, with the medical school of Guy's Hospital ; but I believe it was about the year 1804. His coadjutors in the course of lectures on Chemistry were successively the late Dr. Babington, then the late Dr. Marcet, and afterwards Dr. Bostock —all names eminent in the annals of Science. In that establishment the several branches of Experimental Philosophy formed a separate course, which exclusively devolved on William Allen. It was about the same time, too, that he accepted the chair of Experimental Philosophy at the Royal Institution, which he occupied for several years. From the professorship at Guy's Hospital he did not wholly retire till the year 1827 ; and I have in my possession a copy of the substance of an address to the students, at the close of his course on Experimental Philosophy, which he was so kind as to give me in one of my interviews with him, on the business of this Society. Did time permit, I should have been much gratified in being able to give you an extract from it, on the indestructibility of matter, and its resolution into and varied combination of proximate and ultimate principles, a subject which has of late years been so beautifully illustrated, and confirmed by means of organic analysis. But the whole, while it exhibits the result of his meditations as a philosopher, bespeaks that happy discipline of the human mind, so desirable in the pursuit of science, and so necessary in a teacher of youth—proving and enforcing as it does the claims of natural and revealed Religion, as being not only commensurate with, but paramount to, the acquisition of every other species of knowledge to Man, as a reasonable and responsible being.

His talents as a philosopher necessarily brought him into habits of intimacy with the most celebrated men of science of the day, among others, with the late Sir Humphry Davy, and the venerable John Dalton—men to whose brilliant discoveries Chemistry is indebted for principles of the most useful and enduring character. But his most intimate associate and friend was William Haseldine Pepys, with whom he was for several years engaged in chemical investigations, the more prominent of which

were communicated to the Royal Society, and printed in the *Philosophical Transactions* of 1807, 1808, and 1809. Of this Society William Allen was elected a Fellow in 1807, having been previously made a Fellow of the Linnæan Society, and a Member of several foreign scientific institutions.

The first of these papers related to the quantity of carbon in carbonic acid, and to the nature of the diamond—establishing the accuracy of Lavoisier's previous statements with respect to the former subject, and confirming the result of Mr. Smithson Tennant's celebrated experiments on the latter. Lavoisier's estimate of the quantity of carbon in carbonic acid was 28 per cent.; but Guyton de Morveau assigned the proportion of carbon as only 17.88 in the 100; and this latter proportion had continued to be "adopted in all the systems of Chemistry." It was under these circumstances, and with a view to settle the question, that the experiments of Allen and Pepys were instituted. The result at which they arrived was, that 100 parts of carbonic acid contain 28.6 of carbon. By the same paper, they demonstrated that the diamond is pure carbon; that well-burnt charcoal, when wholly deprived of water, contains no hydrogen, and that it is not, as was then supposed by some, an oxide of carbon. Later experiments have established the truth, that carbon is an elementary substance.

The other papers, together with one communicated as late as 1829, refer to the changes produced on atmospheric air and other gases by respiration, in which, among other results, it may be mentioned that the quantity of carbonic acid emitted in respiration, was found to be exactly equal, bulk for bulk, to the oxygen consumed; that, therefore, there is no reason to conjecture that any water is formed by a union of atmospheric oxygen with hydrogen in the lungs: that no hydrogen, nor any other gas, appears to be evolved during the process of respiration, and that a middle-sized man, of thirty-eight years of age, gives off from the lungs, in twenty-four hours, as much carbonic acid as contains eleven troy ounces of solid carbon. Menzies, according to Dr. Pereira, in his Lecture on the Elementary Composition of Foods, states the quantity to be much higher.

For the other results of these investigations I must refer you to the papers themselves, which contain an account of a most elaborate series of experiments and calculations; but one sentiment in them I have transcribed, as worthy of imitation at all times, and as developing the value of patient and laborious investigation. They say,

"We have thought it right to give a simple statement of facts; in no one instance have we endeavoured to strain or accommodate them to suit any particular theory, being fully aware, that

every experiment carefully made and faithfully recorded, will remain an immutable truth to the end of time; while hypotheses are constantly varying, and even the most beautiful theories are liable to change."

Another interesting object of science with William Allen, and one which he pursued with great delight, when relaxation from public duties permitted, was Astronomy—possessing the facilities of an observatory, as well as some valuable instruments.

With the view of being set at liberty to pursue those various objects of a philanthropic character, to which so large a portion of his life was afterwards devoted, he withdrew, many years since, from personal attention to the business in Plough Court—the care of which latterly devolved exclusively on his partners in that concern; and though continuing his interest in the advancement of science, he applied himself to the promotion of objects which, if less attractive in the eyes of men, may, without at all depreciating the value of scientific research, be considered as more immediately conducive to the welfare and subservient to the higher necessities of mankind. In these labours of love, for the glory of his God, and for the good of his fellow-men, he went down to the grave in a good old age, dying in his seventy-fourth year, on the 30th of last month, esteemed and respected in his native country, and in foreign countries also, where he was either personally or beneficially known.

Such, then, was the professional career of William Allen; and if we contemplate it in connexion with his private virtues, and the prominent part they led him to take, in the great schemes set on foot for promoting Religion, Charity, Education, and Civil Liberty throughout the world, we can readily conceive that his reputation would become most deservedly great, in the eyes of the profession and the public, and the general confidence and respect of his brethren drawn towards himself. We find him accordingly applied to whenever the Chemists and Druggists were called together for any special purpose; and at the time our Society was founded, he was one of the few survivors of a previous association, and was in possession of its funds as the only remaining Trustee. No sooner had it become necessary to unite the scattered members of the trade, for the preservation of their own privileges, than he evinced his usual readiness to enter warmly into their interests; and when the first successful efforts were followed by the establishment of a permanent Society, he was unanimously requested to become its first President; and I can truly say, that while his age and increasing infirmities, together with the urgent claims on his time and attention from so many other important quarters, prevented his appearing amongst us as often as he could have wished, he has been a frequent

attendant at our Council-table, has presided at our annual meetings, and has generally made a point of conducting personally the intercourse held with the Government and Corporate bodies; and, I must add, cheerfully undertook the no small labour of affixing his own signature to upwards of 1600 of our Certificates of membership.

To his name and influence as well as to his advice we are more indebted than perhaps we are aware of, and we have reason to feel deeply the loss we have sustained in the removal of William Allen, succeeding, too, as it has, in a few short years, that of another estimable but younger cotemporary of his—the late Mr. Hudson, whose services to the trade on many former occasions, and whose prompt and energetic aid in every useful and benevolent design, ought never to be mentioned but with gratitude and respect. I can only most sincerely hope that a large portion of their public spirit will devolve on their descendants, and that all whose talents and influence give them a just claim to the eminence they enjoy, will never be found wanting in zealous exertions to promote the welfare of their less favoured brethren, and to advance the scientific art to which we all belong.

In speaking of William Allen this evening, I would especially commend his example to you as a Pharmaceutical Chemist: combining as his character does, that of the man of science and the man of business too, we see in it the possibility and the advantage of such an union; and if we think but for a moment on the important objects which constantly occupy our time and attention, the necessity of such a union will be apparent also. If duly impressed with a sense of the responsibility which our occupation involves, we shall not, in the laudable exertion to establish a business, forget the legitimate way of establishing, at the same time, a deserved reputation for conducting it.

It will be useful moreover for us all, and especially for the junior members connected with our Society, to dwell with some attention on the general character of William Allen—in doing so we shall perceive that Christian principles are by no means incompatible with the cultivation of science and philosophy, while they are undoubtedly the only solid basis upon which to erect the superstructure of moral worth—involving, as that does, sterling integrity and diffusive benevolence; that, if we would establish a reputation with a view to our own temporal prosperity, or that will give us a beneficial influence among our cotemporaries or in general society, the safest and the surest road is the cultivation of such principles, and the exemplification of them, in daily life.

Nothing, I am persuaded, would have afforded more real satisfaction to our deceased President, in this portion of his many useful labours, than to have witnessed the good effects which we

hope the Society will produce, on the character and qualifications of future Chemists and Druggists, and I only speak the heartfelt sentiments of those who have had the happiness of working under him, when I add, that this, and this only, is the reward we care for or hope to receive.

One word more—let us ever remember the unceasing counsel of our esteemed friend, "Cherish harmony and good feeling among yourselves." To this most benevolent sentiment may we all cordially respond; I commend it to your consideration from the bottom of my heart, and I trust we may all be enabled to practise it in our mutual endeavours to perfect the work, which, under his superintendence and example, has been so well begun.

The Chairman then said, that the scientific business of the evening would commence with the reading of a paper,

ON THE GALLS OF TEREBINTHUS AND PISTACIA.

BY M. GUIBOURT,

Professeur de l'Ecole de Pharmacie, Paris.

In the circuit of the medical jury of the department of Eure, made by M. Ledanois in conjunction with MM. Richard and Gonillart, a *pharmacien* of Bourgthéroulde presented to the jury a substance, the nature and origin of which he was ignorant of, having found it in the stock of his predecessor. This substance, which was broken, had the appearance of a fragment of a dried pericarp. The colour was reddish grey, it had no odour, but a very astringent taste. M. Ledanois analysed it, and found its composition to be as follows:—

Gallic Acid	15
Tannic Acid or Tannin	60
Soft Resin or Turpentine	4
Caoutchouc	1
Inert residue	20
	100

A portion of this substance having been sent me by M. Ledanois, I replied at first that it resembled the gall of the terebinth, mentioned by certain ancient authors, but having found in my own stock two other analogous galls, one of which coincides better with the gall of the terebinth, I think it right to recapitulate here the short descriptions which have been given of this substance, to describe the characters of that which I possess, and to request those persons who may have a better opportunity

of identifying its origin, to publish the information in a scientific journal.

We find in the *Observations* of Lobel (page 538, fig. 2), in the *History of Rare Plants*, by Clusius (page 15), and in the *History of Plants*, by Bauhin (lib. iii, page 279), one only and the same figure of the terebinth (*Pistacia Terebinthus*), having, at the extremity of the branch, a gall formed like a horn, lengthened and contorted, which so exactly represents one which I possess, that the origin of this appears to be well defined; but this gall is not the one found with the *pharmacien* of Bourgthéroulde. This horn-shaped gall, however, is not the only one which the terebinth can produce, for Clusius himself mentions another *vesicular* one, adhering to the leaves and to the branches, nearly similar to that of the leaves of the elm. Again, J. Bauhin mentions having observed frequently on the terebinth an excrescence similar to a leathern bottle (*outre*), like that of the elm, and at other times, at the extremity of the branches, reddish horns from four to six inches long, of a cartilaginous substance, and containing a viscid humour, in which are contained small aphides (*pucerons*).

According to the monks, editors of Mésué, the terebinth bears two different fruits, and probably three. The first does not ripen, the second is developed in bunches, and becomes larger than that of the lentisc*. The last, if we may be allowed to give it this name (we allude to the galls), is constituted like the bladders of the elm, though different in form and colour, for the former are lengthened, depressed, and in the form of a goat's horn, whence the tree has taken the name of *cornucapra;* the latter are round like apples, or oblong like plums, and of all these varieties, some are partly white, partly red, others are lemon-coloured and white, others, again, greenish. All, when ripe, are filled with aphides (*pucerons*).

According to Bélon, the peasants of Thrace and Macedonia collect the galls of the terebinth about the end of June, under the leaves or at the foot of the branches which bear the fruit, and there they find a small gall the size of a hazel-nut, which, if allowed to grow, would become long like a small horn, but they gather it while very small, and sell it at a high price to dye fine silks in the town of Pruse (*Singulariter*, book i., c. 65). They use annually above 6000 pounds of these galls. They are hollow within, of the size of small Roman galls, growing on the leaves of the male terebinth. When they are not gathered, they grow half a foot long, and horn-shaped (*ibid.* book iii., c. 49). Bélon, as it would appear, believes that all the galls of

* See *Journal de Pharmacie*, tom. xxv., p. 481.

terebinth form one species, and that they only differ from their age; but it is probable, as is the case with the galls of the oak, that different parts of the terebinth may be impregnated by different insects, and produce galls quite distinct. I do not pretend to conclude from this that the three galls which I possess are due to the terebinth. I believe them, on the contrary, to be produced by a different tree.

Lobel, whom I have already quoted, has published two other figures of *Pistacias*, with horn-shaped galls. One of these (*Observations*, page 539), borrowed from Dodonæus, is given as a pistacia, and the gall in fact resembles that of the pistacia, but the tree appears to me to be a *Terebinthus*. The other figure, much better done, is found in the *Adversaria*, p. 12. This tree is a true pistacia (*Pistacia narbonensis, L.*), bearing two sorts of galls, one in the form of a spindle, nearly straight and lengthened to a point at the extremity; the other, short, angular, rounded, and double. The spindle-shaped or horn-shaped gall, is very probably the second sort which I have to describe, and the small double gall is perhaps the young state of the third sort to which belong the galls of the *pharmacien* of Bourgthéroulde. After having thus established, as far as it is possible, the origin of these three galls, I proceed to describe them.

1*st sort: Horn-shaped Gall of the Terebinthus.*—Represented in the *Observations* of Lobel, page 538, and in the *History of Rare Plants*, by Clusius, page 15. This gall has the form of a long and flattened vesicle, enlarged at the middle, and tapering to a point at each extremity. It is generally folded back upon itself, near the peduncle, and often bent in the contrary direction, near the opposite points, so that the gall is *bistorte* (twice bent). I possess one specimen entire, 7 centimetres long, by 17 millimetres broad, and several large specimens not entire, from 30 to 35 millimetres broad, the length of which might have been from 16 to 18 centimetres. This gall has a decided red colour, especially externally, it is pretty regularly striated longitudinally, *smooth*, only a millimetre thick, and empty internally, except a small quantity of the exuviæ of insects. The substance of the gall is compact, rather translucid, mixed with white woody fibres, which reach from one extremity to the other.. It is loaded with a resinous juice, which exudes in places outside or inside. It has a very astringent taste, slightly aromatic, similar to Chio turpentine, and this character is so manifest, that it is sufficient to prove that the gall in question belongs to the genus *Terebinthus*. Lastly, it must be observed, that this gall, being formed by a puncture on a terminal bud, is always simple and terminated by a single point.

2*d sort: Horn-shaped Gall of the Pistacia.*—This gall

appears to me to be represented in the *Adversaria* of Lobel, page 412. It is from 4 to 6 centimetres in length, from 8 to 15 millimetres in breadth, more or less bent, and terminated by a sharp point. It is tortuous in its length: it is covered with a dark grey epidermis, and has sometimes on its surface small flat and circular glands, from which a yellow resin exudes. The substance of the gall is quite black, light, fragile, and from $\frac{1}{3}$ to $\frac{1}{2}$ a millimetre thick. The taste is simply mucilaginous with an aromatic flavour. This gall is entirely without astringency.

3d sort. Cauliflower-gall.—Before receiving the specimen from M. Ledenois, I possessed an entire gall and a fragment of this sort, which must result from the monstrous development of a flowering bud, still retaining at its base vestiges of scales impregnated with a resinous juice. From the base, the pierced bud appeared to divide into three or four branches, each bearing a gall; but of these galls there only remain one entire, and a portion of a second. The entire gall, in rising from the peduncle, is enlarged rapidly into a fan-shape, and separates itself near the middle in two unequal parts, on which are prominent points indicating other divisions less marked, or more completely merged and confounded. The greatest length of the gall is forty-seven millimetres, and its maximum breadth thirty-two. This gall, when fresh, must have been covered with a yellowish down, which remains in the hollow places, while the prominent parts have become brown and polished by friction. The substance of the gall is rather more than a millimetre in thickness, whitish, and translucid in its fracture, and so compact and gorged with juice, that it presents, when cut, the appearance of a dried gum-resin. It has no reticulated exudation, and possesses a very astringent taste, without any resinous flavour or smell.

The gall fragment, which was sent me by M. Ledanois, only differs from that which I have just described, by its uniform dull grayish-red colour. It has the same yellowish down on the exterior—the same compact, translucent, and whitish substance within, and the same astringency, without aromatic or resinous taste. Some small entire galls which are with it, resemble the small angular excrescences in the figure of Lobel (*Adversaria*, p. 412); however, they differ from the black horn-shaped gall above described (the 2d sort).

It is evident that this third gall is the most important of the three, from the large proportion of tannin which M. Ledanois has found in it. It is to be regretted that it is so rare, and so little known.

APPENDIX TO THE PRECEDING PAPER.

BY M. GUIBOURT.

The preceding notice having been addressed to Mr. Bell and Dr. Pereira, to be read at the Society of Pharmacy in London, as a tribute of gratitude for the civilities which I have received from many members of that Society, Dr. Pereira sent me, in a letter, some fragments of two galls which appeared to him to resemble those which I had described. One of these substances, labelled *pistachio galls*, had been given to him by Dr. Royle, who, in his work entitled *Illustrations of the Botany of the Himalayan Mountains*, page 178, says, that these galls are called *Gool-i-pista*, and that they come from Caboul and from Bokhara. The specimen sent to Dr. Pereira, bears also the name of *Bay Ghuny*.

I think that this gall, notwithstanding the names which have been assigned to it, belongs to the terebinth, rather than to the pistacia. I rely on its red colour, its turpentine taste (rather feeble, however), and the small round tears, like mastic, which accompany it. I do not deny that the pistachia is common in Bucharia; but the terebinth-trees doubtless are found there also, the same as in Persia, where Kæmpfer met with them in such great quantity, under the name of *Ben* or *Wen*, that a chain of mountains, situated in the province of Laar, has taken the name of *Benna* (*Amœnitates*, pp. 409 and 413). The following is an extract from what Kæmpfer says of it:—

"The terebinth grows in great quantity in the stony and deserted recesses of the foggy mountains in the environs of Schamachia in Media, of Schiras in Persia, and of Laar in Luristania. I have seen it nowhere more abundant than on a stony mountain near Majin, a day's journey from Schiras. Two varieties of the tree were pointed out to me there, the more common one retains the name of the genus, and is called *Diracht Ben* or *Wen*; the other, which is more rare, is called *Kasudaan*, or, as the peasants pronounce it, Kasudèn, &c. I have seen on several of these trees a remarkable excrescence, adhering without pedicle, almost at the extremity of the branches, which might about fill the closed hand, of a round figure, formed of several rows of tubercles (*ex pluribus tuberculorum spiris*) the size of a cock's comb. This gall had a brilliant carmine colour, and an elegant aspect: the substance was hardish, rather fungous and fragile, whitish within, and filled with a thick juice of a fragrant odour, almost like that of the true balsam of mocha."

The gall of terebinth, observed by Kæmpfer, differs in form from that which I have just described, but is identified with it by its red colour, and by the resinous juice with which it is impregnated. It is these characters which induce me to believe

that the *gall of pistachia*, brought by Dr. Royle, is also a gall of the terebinth.

The second gall, of which some fragments have been sent me by Dr. Pereira, under the name of *Chinese galls*, was given to him by Mr. Reeves, who resided for some years in Canton. This gall, that which I have named *Cauliflower gall*, and that found in a shop in Bourgthéroulde by Mr. Ledanois, appear to me to form three varieties of the same species. The cauliflower gall is of a dark brown colour externally, that of Bourgthéroulde is grayish, and the Chinese gall nearly white; but with the exception of this difference, which possibly might depend upon the age of the gall on the tree, or the length of time since it was gathered, these three galls appear similar, and as it is certain that the gall of Dr. Pereira comes from China, it appears to me very probable the others come from China also.

In making some new researches on these matters, I have found (in the *Memoirs of the Royal Academy of Sciences in Paris*, A.D. 1724, p. 320) a paper by Geoffrey, junior, where this Chinese gall is very well described. Geoffrey states, that this gall is to be found in the cabinets of the Royal garden, under the name of *Oupeytze* (this name scarcely appears Chinese) and that those received commercially, have the name of *Indian ears* (*Oreilles des Indes*) which the merchants convert into the phrase *ears of Judas*, confounding them with a mushroom so named.

"This gall," says Geoffrey, "is recommended for dyeing, and it is commonly used for this purpose in China. It has a very acrid taste, and has so much astringency, that it is preferable to all other kinds of galls which are used by the dyers: it also produces the effect of the gall-nuts in a more prompt and decided manner."

This conclusion of Geoffrey accords perfectly with the great quantity of tannin found in this gall by M. Ledanois, and with the regret which I expressed at the end of my notice of it, that it is so rare and so little known.

To recapitulate—I have described three perfectly distinct galls:

1st. The *gall of the terebinth*, red, hornshaped, very voluminous, and having a very astringent and turpentine taste.

2d. A *black gall*, not astringent, which, I believe, belongs to the pistacias.

3d. A *cauliflower gall*, which also much resembles that found by M. Ledanois at Bourgthéroulde, and that received by Dr. Pereira from China, to admit of any doubt that they all three have the same origin.

I subjoin the figures of these different galls, represented the natural size:

FIG. 1.

A. Horn-shaped gall of Terebinthus, superior extremity. *A* 1. Inferior part of another similar gall. *B*. Small entire gall of Terebinthus, lying on its side.
B 1. The same placed flat. *C*. Black gall attributed to a Pistachio. *C* 1. A similar one not entire, *D*, Cauliflower gall, seen on the most convex side.
D 1. The same, seen on the flat side.

ON THE CHINESE GALL, CALLED "*WOO-PEI-TSZE*," AND ON THE GALL OF BOKHARA, TERMED "*GOOL-I-PISTA*."

BY JONATHAN PEREIRA, M.D., F.R.S.
Assistant Physician to the London Hospital.

SINCE the preceding paper and appendix were received from Professor Guibourt, I have obtained some further information, respecting both the Chinese gall as well as the gall of Bokhara.

1. *Of the Chinese gall.*—This gall is described in the Chinese Herbal, *Pun Tsaou*. An excellent account of it is contained in Du Halde's* *Déscription Géographique et Historique de la Chine* (Paris, 1770). This writer terms the gall "*Ou poey tse*." Specimens of the galls were sent, many years since, by Mr. Reeves to the late Sir Joseph Banks, and an analysis of them was made by Mr. Brande †, who states, that 100 parts yielded, to cold distilled water, seventy-five parts. Alcohol extracted from the residuum about four parts, leaving twenty-five parts of insoluble woody matter.

In the *Pun Tsaou* is a rude figure of a branch of the tree with the galls hanging therefrom. The following is a *fac-simile* copy of it.

FIG. 2.

Branch of "*Yen-foo-tsze*" with the "*Woo-pei-tsze*" growing thereon. (From the Pun-Tsaou).

* The octavo English translation of Du Halde's work, contains an imperfect translation of a portion only of Du Halde's account of this gall.

† *Observations on an Astringent Vegetable Substance from China* (in the *Philosophical Transactions*, 1817, p. 39).

The sentence in the upper and right-hand corner is "*Woo-pei-tsze*" (*Ou-poey-tse* of Du Halde); that in the lower and left-hand corner is "*Yen-foo-tsze*" (*Yen-fou-tse* of Du Halde). The third is *Foo Muh*.

The following translation of the Chinese account of the gall was made by the late Dr. Morrison for Mr. Reeves, who has kindly permitted me to publish it:

"The gall-nut is said to be produced in the region of Sze-chun province. They anciently spoke of the leaf of the tree as having a sour taste, and used it in soup. They called it also a '*vegetable salt.*'

Yen-foo-tsze *

"The nut was found in the seventh or eighth moon, and had a dust on it, called '*salt powder.*' This powder, on the outside of it, is also compared to snow; it was not only used in making soup, but also in quenching thirst, and as a defence against the vapours peculiar to the hill country.

"The tree on which it is formed resembles the chun-tree. The leaves grow in pairs; are serrated, green at top, and white on the under surface. They have a down on them, which is of a sour taste. Between the regular pairs of leaves there is a single leaf [which] shoots out like an arrow from the branch or twig. This leaf resembles a feather. In the fifth or sixth moon, it blossoms, and a head, like an ear of corn, is formed; many of them seem to grow together on the branch. In the seventh moon, a nut is formed like a flat pea. When growing, it is green; and when ripe [of] a rather purple colour. The kernel is rather green, and in form resembles a kidney. On the skin is a thin layer of salt, which children eat. On the leaf is an insect, which forms the "*Woo-pei-tsze*," and which is taken off in the eighth moon."

The following observations, made by Dr. Morrison, are contained, in the form of a foot-note, in the same letter:

"*Yen-foo-tsze* is called by a great many names. One is *Teen-yen*, a '*natural salt*,' and some places are mentioned on the western frontier, where they use no other vinegar than what they get from these leaves.

"*Woo-shih-tsze* † also comes from the west, and from India. The tree is said to be sixty or seventy cubits high, and eight or nine cubits in circumference; and grows in sandy-stony places. It is compared to the camphire-tree. It flowers in the third moon; the flower is white, and rather red in the centre. The bud formed is round like a ball; at first green—when ripe, yellowish. An insect eats into it, and forms a hole in it. They say, that the tree one year produces the *Woo-shih-tsze*, and another year produces something else which resembles a chestnut.

"Another name is *Whip-ztsip-tsze*. It has various medicinal properties. It is used with some other ingredients for dyeing beards black.

"The taste of the *Woo-pei-tsze* is, according to them, a sour-saltish taste —of the *Woo-shih-tsze*, a bitter taste."

Mr. Reeves has placed in my hands his collection of these galls for examination. They are hollow vesicles, the parieties of which are thin, have a horny appearance, but are brittle, and have a resinous fracture. Externally they are velvety, and in-

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* In Dr. Morrison's letter, "*Yen-foo-tsze*" is written over the word "nut."

† This, Mr. Reeves informs me, is the gall-nut of the oak.

ternally are usually coated with a white chalk-like matter and insect remains. Their colour is fawn-gray, more or less deep. Their size and shape is subject to considerable varieties. In the subjoined cut, are represented, of the natural size, three large, and one small, specimens. Most of the galls are tuberculated, some, however, are even. They are rarely rounded. Most of them are branched, in some cases in the manner of a stag's antlers.

FIG. 3.

Chinese Galls, or "Woo-pei-tsze."

Du Halde states, on Chinese authority, that they are sometimes as large as a man's fist. "At first," he says "they are dark green, but afterwards become yellow. The peasants gather them before the frost sets in, and expose them, in an osier sieve, to the steam of boiling water to kill the insects."

Mr. Brande observes, that the absence of extractive in these astringent substances renders them peculiarly fitted for the basis of a black-dye, and of writing-ink, while it at the same time renders them ill calculated for the production of leather, which without extractive matter, is brittle and imperfect.

2. *Of the gall of Bokhara.* — Dr. Royle, in his *Illustrations of the Botany of the Himalayan Mountains* (p. 178), says, when speaking of the pistachio—

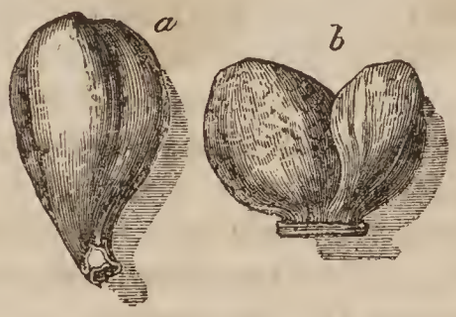
"From Caubul, or, as I was informed, from Bokhara, the almond, as well as its pericarp, is imported into India, together with a kind of gall, called *gool-i-pista*, stated (as in *P. Terebinthus*) to be formed on, and a resin, called *aluk-oolunbat*, produced by, the pistachio-tree."

As Professor Guibourt entertains sundry doubts as to this gall being formed on the pistachio-tree, I wrote to my friend, Dr. Royle, on the subject, and I subjoin an extract from his reply:

"I wish I had time to search for some information respecting the *gool-i-pista*. You know I have never been in the country where the pistachio is produced, that is, Caubul and parts of Affghanistan. The pistachio is yearly brought down to India; and I was told by people who well knew the tree, that the *gool-i-pista*, literally "flowers of the pistachio," were produced by this tree. It is, moreover, mentioned in Persian works on Materia Medica, as *Bar-durakhl-pista*, that is, "fruit of the pistachio-tree," and they give, as the Arabic name, *Buzghurig*, but I have been unable to trace this word in my Latin copies of Serapion and Avicenna. It may, however, be there; for the same words are so differently spelt by different translators, that it is hardly possible to recognise them. My notes of them state, that one year the tree bears fruit, and the other year these galls, or *gool-i-pista*.

"My information, therefore, you must consider as derived from the northern merchants, after very particular enquiries, before we had access to the above countries. It may, notwithstanding, be incorrect; but it is confirmed by the Persian authors, who wrote in the very countries where the pistachio is well known, and who distinguish the terebinth-tree from the pistachio. But I see no reason why two species of the same dicœcious genus may not produce similar products, whether they be always galls or abortive germens—at least some of them have this appearance, and may be stimulated into diseased growth, as the bud of the oak or the grain of rye. I have no proof that the terebinth-tree extends to Caubul. I know it is mentioned as yielding such galls in Syria and, I believe, other parts of the Mediterranean. Unless M. Guibourt's evidence is very satisfactory, and until travellers trace the *gool-i-pista*, which is brought by the northern merchants from Caubul to Saharanpoor, where I got them, to some other tree, I myself should feel inclined to consider the *gool-i-pista* is produced by the pistachio.

"The largest of the galls which I have seen, are nearly equal in size to a very small cherry. They are brownish externally, hollow, and greatly resemble abortive germens. Some of them are lobed or double.



Galls of Bokhara, called "Gool-i-pista."

ILLUSTRATIONS OF OUR PHARMACOPŒIA.

BY MR. G. M. MOWBRAY,

Fellow of the Medico-Botanical Society, &c.

The Pharmaceutical Chemist who conscientiously desires to obey the authors of the Pharmacopœia, and yet to preserve a uniformity of composition in his preparations, has no easy task

before him. The directions are concise, and seem simple enough, but in reality they are not so:

"Fronte exile negotium
Et dignum pueris putes;
Aggressis labor arduus,
Nec tractabile pondus est!"

The vagueness of some of the directions might almost make one suspect that the chemical reviser of the last London Pharmacopœia did not always fully understand the formulæ which he sanctioned!

Before adducing examples of the uncertainty and vagueness which I reprehend, I will remind the reader, that the necessity of accuracy has since been insisted upon by the College translator, in his "Illustrations of Pharmacy," published in the Pharmaceutical Journal; and it is, therefore, the more essential that the directions of the Pharmacopœia should be corrected when wrong, and cleared up when obscure. We must consider too that little people are often blamed for the mistakes of their betters:

"Quicquid delirant reges, plectuntur Achivi."

The chemical critic hastily supposes, that if preparations of the same name, obtained from different shops, should differ in composition, the Druggist must necessarily be in fault; whereas it sometimes happens the blame should be fixed higher up: the streams are not pure because the fountain is turbid. In other words, the practical Chemist may be censured, when the fault is in the formula which he is enjoined to follow.

Without farther preface, I will now state a few objections to some of the formulæ for the preparations of iron:

1. *Ferri sesquioxidum.*

We are informed that the powder prepared by the College formula sometimes contains a small quantity of carbonic acid. This is really the case, and the formula is therefore inadmissible, as will be seen in treating of the *tinctura ferri sesquichloridi.* Moreover, the method is never followed by the manufacturing Chemist, unless he wishes to make the *ferri carbonas saccharatum* of the Edinburgh Pharmacopœia. If desirable to avoid the expense of procuring the hydrated sesquioxide, I would suggest a formula introduced, I believe, by Faraday, which formula yields a very beautiful per- or sesquioxide, and has been since recommended by Berzelius.

Take Sulphate of Iron, one part.
Chloride of Sodium, three parts.

Mix intimately, calcine at a red heat, and dissolve out the saline mass. The sesquioxide remains as an impalpable powder, of a deep chocolate-red colour.

The objection to the London process is, that the product varies in composition. Sometimes, especially if very carefully and rapidly prepared, it contains carbonate of protoxide of iron; but if more time is occupied in drying it, at a low temperature, then we have a carbonate of peroxide with an excess of base. When the former of these varying compounds is used to prepare the tincture of sesquichloride of iron, we first obtain a mixture of

Protochloride of Iron, and
Sesquichloride of Iron.

By exposure to the atmosphere, the protochloride is converted into per- or sesquichloride of iron, while basic oxichloride or a subsesquichloride of iron is precipitated. In Mr. Phillips's translation of the London Pharmacopœia, the following passage occurs: "This tincture is of a reddish-brown colour, and though it is *essentially composed of sesquichloride of iron*, it contains some hydrochloric acid, without which a deposit is apt to be formed in it."

Now, if the *tinctura ferri sesquichloridi* be prepared either with a pure sesquichloride of iron, or even with the moist hydrated sesquioxide of iron, it is not necessary to have free hydrochloric acid in order to prevent a deposit. It was merely requisite to direct the tincture to be made with the dry perchloride procured by sublimation—a method which I strongly recommend: for my own part, I have devised a formula, wherein the play of affinities is somewhat complex, yet interesting; whilst the process is sufficiently facile to be accomplished without much skill on the part of the operator.

Take of Iron filings, ℥ij.
Hydrochloric acid (sp. gr. 1.160, by troy weight), ℥v. ℥vij.

Digest in a Florence flask, assisting the complete saturation of the acid at the end of the process by a gentle heat.* When all action has ceased, filter the liquid, and evaporate to four fluid ounces.

Next, weigh out
Pure Sulphate of Iron (crystals powdered), 250 grs.
Hydrochloric acid (sp. gr. 1.16, by troy weight). ℥iij. ℥ij.
Powdered Chlorate of Potash, 246 grs.

Dissolve the sulphate of iron in the muriatic acid; mix the two solutions; then add the chlorate of potash. From the blood-red solution thus obtained, precipitate the (two equivalents) sulphate of potash by the addition of sixteen fluid ounces of rectified spirit of wine. Filter, and wash the precipitated sulphate of potash with sufficient spirit to make up twenty-six fluid ounces of tincture. One fluid ounce contains 61.4 grains of sesquichloride of iron, equivalent to 30 grains of sesquioxide, or 20.8 grains of metallic iron.

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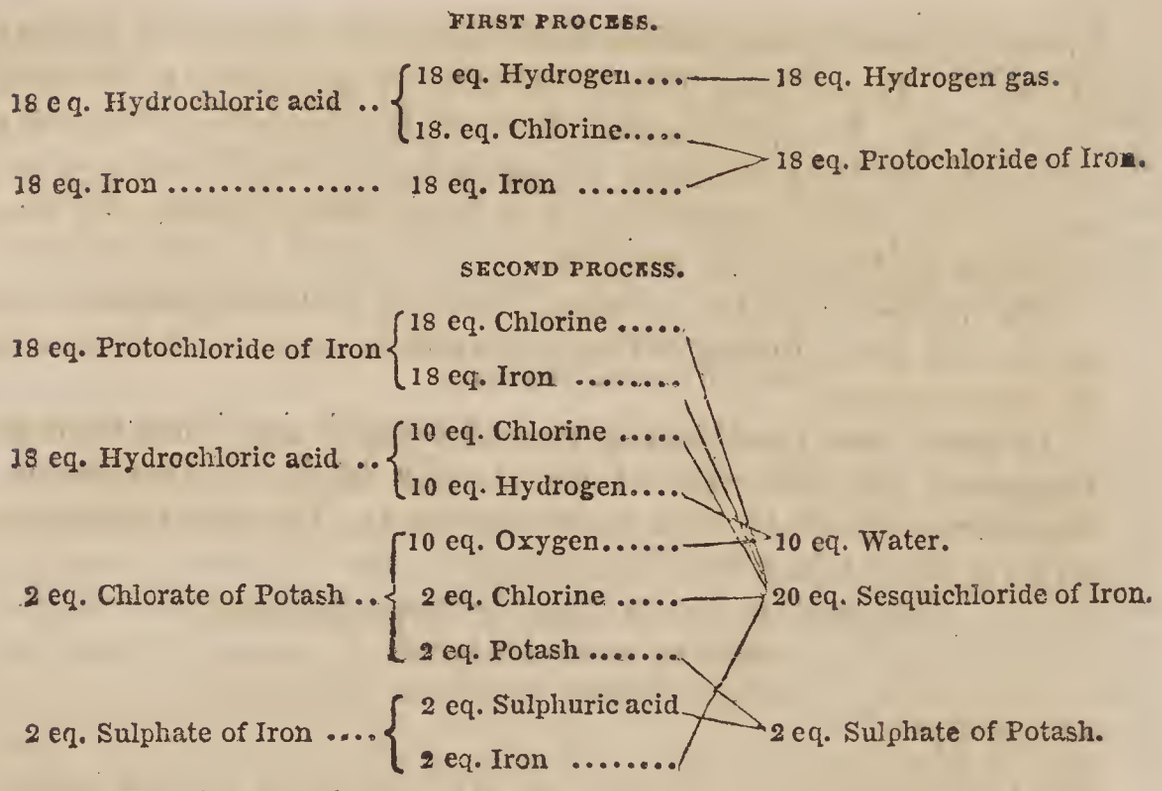
* A bent tube should issue from the mouth of the flask, and be made to dip under a small quantity of water, to prevent loss of acid. This acidified water is then returned on the filings with a view to obtain the full effect of the acid.



2. *Ferri potassio tartras.*

The formula for this preparation is vague and inaccurate. It is as follows:

Take of Sesquioxide of Iron, three ounces.
Hydrochloric acid, half a pint.
Solution of Potash, four pints and a half; or as much as may be sufficient.
Bitartrate of Potash, eleven ounces and a half.
Solution of Sesquicarbonate of Ammonia, a pint; *or as much as may be sufficient.*
Distilled water, three gallons.

The first directions are intended to procure the hydrated sesquioxide of iron, which is to be dissolved in a solution of bitartrate of potash.

After this comes the following passage:

"If the liquor should be acid, when tried by litmus, drop into it the solution of sesquicarbonate of ammonia, until it is saturated."

The translator observes in his remarks, that he "found it to consist of very nearly

"One equivalent of Tartrate of Potash, and
One equivalent of Tartrate of Sesquioxide of Iron.

"This," he continues, "would give rather more than eighteen per cent. of sesquioxide, which agrees very nearly with my direct experiment."

In the London Pharmacopœia we are told to boil the sesquioxide of iron in the solution of bitartrate of potash, while Soubeiran insists upon digestion; for he observes, "prolonged ebullition of the salt in water, above all in the presence of an excess of cream of

tartar, causes decomposition and deposit of tartrate of protoxide of iron." To my cost, I have suffered by attending to the directions of our Pharmacopœia; for, on one occasion, I found the iron reduced from the state of peroxide to that of the green magnetic oxide, whilst operating in a stone vessel containing about eighteen gallons of the solution.

The phrase, "*if* the solution be acid to litmus paper," leads me to ask Mr. Phillips, "Can a persalt of iron be other than acid to litmus paper?"

In order that those who peruse this paper may form their own judgment on these alterations, I will subjoin a translation of Soubeiran's formula, from which that of the Pharmacopœia is said to have been taken with alterations:

Take of Powdered Cream of Tartar, one part.
Distilled water, six parts.
Moist hydrated Peroxide of Iron, q. s.

Digest the whole in a porcelain or glass vessel, at a temperature varying from 120° to 140° Fahr., until the liquid refuses to dissolve more of the hydrate. Filter, and evaporate at a gentle heat; when the liquid becomes somewhat concentrated, spread on plates, and dry in the drying-room.

What improvements can be required in this process? It is simple and concise, and affords a uniform product. The author has evidently considered his subject thoroughly, and practised what he orders. His experiments have been direct; not so those of Mr. Phillips, who, although he has ordered four ounces of sesquicarbonate of ammonia to be used to eleven ounces and a half of bitartrate of potash, *if* the solution be acid to litmus paper, yet in his analysis he cannot detect the least trace of the alkali? Moreover, he arrives at figures giving five per cent. more sesquioxide of iron than Soubeiran, though Soubeiran makes no mention whatever of ammonia!

Is it to be wondered at, then, that the Chemist should be perplexed, the Physician annoyed, and sometimes even the patient alarmed, when the ferri potassio-tartras may sometimes contain ammonia, and at other times none? — when the tinctura ferri sesquichloridi may contain an excess of acid to-day, and become *suâ sponte* duly neutralized to-morrow?—when the sesquioxide of iron may contain carbonate of protoxide of iron with Mr. A, and basic carbonate of peroxide with Mr. B.

I trust that the frankness of my tone may not give offence; my object is not to diminish the well-earned reputation of a distinguished Chemist, but to improve the practice of Pharmaceutical Chemistry.

Mr. Mowbray said, that seeing Mr. Redwood present, he wished, if he might be permitted, to allude to a subject which had occupied the attention of that meeting at their previous sitting;

he meant, the subject of the solubility of sulphate of potash. The point to which he wished now particularly to refer, was, the disputed one, as to the presence of sulphate of lime in the sulphate of potash of commerce. He (Mr. Mowbray) had stated, that the sulphate of potash sent him by Mr. Redwood, contained lime; and he was happy to be able now to say, that if he were wrong in this assertion, at least he erred in good company; for he was confirmed in this statement by four Chemists who had given him their opinions, that the salt in question did contain a minute quantity of sulphate of lime. He had retained a portion of the sulphate of potash sent him by Mr. Redwood, and could vouch for the identity of the specimen tested.

Mr. Morson thought the time of the meeting ought not to be occupied with the further discussion of this subject, as the question of the presence of a minute quantity of lime in sulphate of potash was one of very little importance, seeing that it would not affect in any way the properties ascribed to the salt. He might add, however, that for himself, he was fully satisfied that the sulphate of potash of commerce did not contain any lime. He had carefully examined a specimen of the salt, the same as that used by Mr. Redwood, and 1000 grains, the quantity on which he operated, afforded not a trace of lime.

Mr. Redwood wished to remark, in reference to Mr. Mowbray's observation on the identity of the salt, with regard to which this difference of opinion had arisen, that the sulphate of potash he had used, as he stated on a previous occasion, was some of the sulphate of potash in crystals, as sold by Messrs Howard, of Stratford. Previous to using the salt in his experiments, however, he had recrystallized it; and, therefore, it was the salt in this state to which reference ought to be made. He was willing that the question should be determined with reference to any specimen of Howards' sulphate of potash, recrystallized as he had described.

Mr. Morson said, he had not recrystallized the salt on which he had experimented; he took the ordinary commercial sulphate of potash, selecting clear crystals, but he found no lime in it.

[*Note by Mr. Redwood.*—The above question may, perhaps, be most easily settled, by suggesting the probable cause of the discrepancy of opinion which has been expressed. The sulphate of potash alluded to, contains no lime; but the solution of it may be very easily contaminated with lime, by merely passing it through common filtering paper.

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Dispensatory of the United States of America. By G. B. Wood, M.D., and F. Bache, M.D.	1843	Dr. G. B. Wood, (Philadelphia)
Henry's Elements of Chemistry, 6th edit., 2 vols.	1810	Mr. G. B. Gunton
Dickson on Chemical Nomenclature	1796	
Parkinson's Chemical Pocket-Book	1803	
Beaumé's Manual of Chemistry	1786	
Murray's Materia Medica, 2d edit. 2 vols.	1813	
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Duncan's Elements of Logic	1770	
Saul's Account of the Barometer	1735	
Bath on Medical Character		
Gannal on Chlorine, by Potter	1830	Mr. John Savory.
Turnbull on Veratria	1834	
Quin's Traitement Homœopathique du Cholera	1832	
Stevenson on Cataract	1839	
Thorn on Copaiba	1827	
Parkinson's Hospital Pupil	1817	
Elliot's Medical Pocket-Book	1798	
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Annales de Thérapeutique, No. 8	1843	
Morton's Veterinary Pharmacy	1843	Mr. Morton.

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Messrs. Davy, Macmurdo and Co.—China Turmeric, imported from Macao—Cheya Root.

Mr. Henry Taylor, *Pall Mall.*—Fine specimen of Sugar of Milk.

Messrs. Godfrey and Cooke.—Amomum Clusii (Fructus).—Ptychotis Ajowain (Fructus).—Acacia Scandens (Semina).—Asphaltum—Native Platinum—Pearls—Occidental Bezoars—Bolognian Stone.

Mr. Wells, *London Street.*—Stick of Sassafras.

Mr. Wm. Hooper, *Russell Street, Covent Garden.*—Powdered Extract of Taraxacum.

Messrs. Winstanley and Sons.—Root of Convolvulus Scammonia, from Smyrna.

Mr. Squire.—Moist preparations of, Papaver somniferum, capsula et radix—Atropa belladonna, rhizoma—Helleborus niger, herba—Cannabis sativa, herba—Apium petroselinum, radix—Marrubium vulgare, radix—Artemisia absinthium, radix—Bundle of Dried Chirayta as imported.

Mr. Scanlan.—Nitrous Ether, made from the refuse liquor of the process for Fulminating Mercury—Magnesian Limestone from Sunderland—Alum Rock, from Sand's-end, near Whitby, Yorkshire—Organic remains found in ditto—Efflorescence found on Alum heap, during the combustion of Alum rock, *sulphate of ammonia.*—Efflorescence of a different kind, found under similar circumstances, *sulphate of alumina.*—Sulphur condensed on the top of alum heaps, during the combustion of alum rock—Sulphate of Alumina—Sulphate of Magnesia contaminated with iron, obtained from the mother-liquor from which alum has been crystallized—Ditto, in large crystals.

Mr. Frederick Barham, *Osnaburgh Street.*—Specimen of Acorus Calamus, from Suffolk.

ORIGINAL AND EXTRACTED ARTICLES.

LEECH CONSERVATORIES.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Having tried a variety of plans for keeping Leeches in a healthy condition, I now venture to recommend one which I have found to answer extremely well, and if you think the following remarks, together with the sketches, deserving a place in your next Pharmaceutical Journal, I am most happy in contributing them. The sketches represent a set of my improved leech conservatories, Nos. 1, 2, and 3. The vessel No. 1 is of four gallons capacity, of unglazed earthenware, perforated from the top to within four inches of the bottom, fitted with a lid ground tight and secured by two iron clamps, which may be fastened by a padlock if required; at the bottom of it I put a quantity of smooth pebbles, about the size of a common pea, under which I frequently find the leeches concealed, and particularly in the cold weather. The vessel is then placed in a cistern, pond, or stream, the latter I consider best if at hand, having adopted it myself with success. In this manner I have kept my leeches for more than

six months, and even during the heat of last summer, I did not lose upon an average more than one or two per week, and in the cooler months I rarely lose one. The vessel No. 2 is of one gallon capacity, and is intended for the shop: it is perforated round the top, but not in the lid as other pots, consequently anything being accidentally splashed upon it, cannot injure the leeches. The lid is ground air-tight, and secured precisely upon the plan of the Cooper's air-tight jar: the advantages of which must be obvious—it may be removed and replaced in a few seconds, and securely too, another great advantage; I also put a few pebbles into this pot. The vessel No. 3 is of half-a-pint capacity, used more for convenience of transit of leeches to Surgeons, &c. The lid of it is perforated and secured as the jar No. 2.

I am, Sir,

Yours with respect,

Peterborough, Dec. 18th, 1843. C. F. BUCKLE.

Fig 1

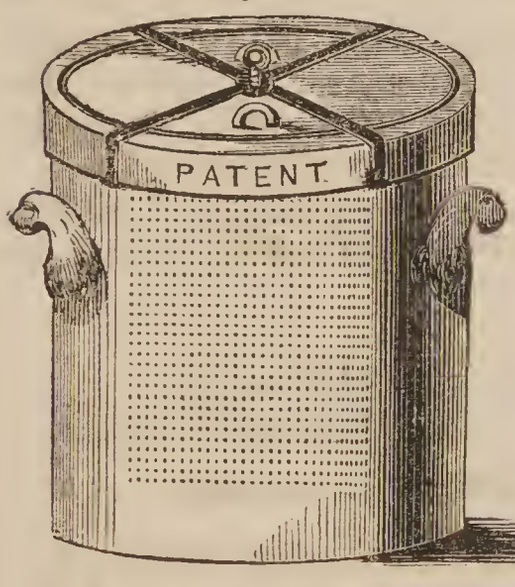


Fig 2

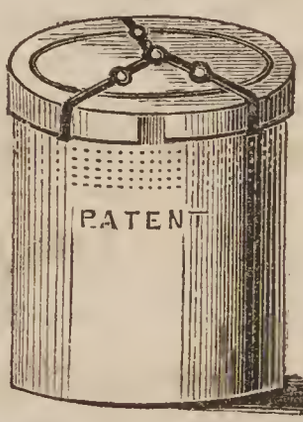


Fig 3

ON THE DISINFECTING POWER OF HEAT.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—HAVING seen in the last number of the PHARMACEUTICAL JOURNAL (page 355), an account of a Committee of Russian Medical Authorities, respecting the destruction of the contagion of the plague, by means of air heated to 144°—167° Fahr., I beg to remind your readers, that the proposal of heat as a disinfectant, is not new in this country, for the late Dr. Henry, of Manchester, in the *Philosophical Magazine* of January and February, 1832,

made experiments which clearly showed this disinfecting power of heat. His experiments (which were successful) were made by exposing articles of clothing taken from persons who had laboured under scarlet-fever, to a heat of 212 to 220° Fahr., for several hours. We all know how difficult it has proved in many instances, to render apartments where scarlet-fever has once raged, again inhabitable, or such infected clothes worn with safety. Full ventilation, fumigations with chlorine, or with sulphur and closed doors, washing, scrubbing, white-liming, and abandoning the apartments for months, have all, to my knowledge, though not by my direction, been tried, without success.

Dr. Henry thought, that a temperature such as above stated, did not merely volatilize the poison, but that it decomposed it, and also, that it would *penetrate anywhere*, through even the *thickest bales of goods*.

May not the virus be preserved by the air being stagnant in the interstices of these bales?

On two occasions my advice has been sought as to the best mode of disinfecting the clothes of scarlatina patients; on one occasion, a large school was in question, and I advised the use of an oven. The clothes were worn afterwards without bad results to any one.

I have no doubt of heat being the most efficacious of all disinfectants in the case of fomites, whether of scarlatina or plague.

I am, Sir,
Yours, most obediently,
J. J. Furnivall, M.D.

3, *Weymouth Street, Portland Place,*
January 4th, 1844.

ON MERCURIAL OINTMENT.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Belfast, January 15, 1844.

Sir,—I had the pleasure of reading your paper "On the minute Division of Mercury," for the first time about two months since. The experiments detailed therein appeared to me to be so satisfactory, and the inferences drawn from them so legitimately deduced, that, to my mind, the question seemed finally set at rest. I had the curiosity, however, at that time, to try

how far the microscopical examination of the subject would coincide with the conclusion at which you had arrived by a totally different process, and was greatly gratified to find the results entirely corroborative of your views. Interesting as the results were, an dthey were most interesting, I should still have considered it unnecessary to give them publicity, but that I find, in the current number of your Journal, the subject has been mooted again. Under these circumstances, I think it desirable that any further evidence which bears upon the subject should be made known, and, if you concur in opinion with me, will feel obliged by your giving the following notes a place in your Journal.

A very minute portion of mercurial ointment having been placed between two slips of glass, and subjected to sufficient pressure to make it spread out into a transparent field, was examined by a power magnifying 290 times lineally, and the magnified image (which I send you) sketched on paper by means of Soëmmering's speculum. This magnified image, as observed in the microscope, exhibited the appearance of a transparent crystalline disc, studded with spheres of various sizes, perfectly opaque, and of a dull leaden hue, not unlike that of ordinary shot. Some few had a rather elongated irregular shape. Upon the application of pressure their sphericity disappeared, and they assumed the form of irregularly-circular gibbous discs, varying in figure with the amount and direction of the pressure, upon the entire removal of which, they perfectly resumed their spherical shape.

A second portion of ointment was spread with the point of a lancet upon another slip of glass, and subjected to the microscope without being covered.

The appearances were similar to those observed in the first specimen, except that the spheres, instead of appearing to be opaque, had, for the most part, a luminous point in each. This puzzled me very much at first, but, on careful examination, it was found to arise from the object being illuminated both by direct and transmitted light. Thus, upon passing a piece of black paper slowly in front of the object until the direct light was entirely cut off, all the luminous points disappeared, and the sphericles exhibited precisely the same opaque leaden hue as those first observed. Continuing to move the paper until it intercepted the light from the reflector, but permitted the direct light to reach the object, the field of view now exhibited a dark disc sparkling with luminous points, which appeared even more bright on account of the contrast. But all doubt was entirely removed upon observing several of those luminons specks resolved, upon correctly adjusting the focus of the microscope, into *distinct* and

perfect images of the window before which the instrument was standing. Yes! in globules not exceeding the $\frac{1}{1500}$ of an inch in diameter — globules so minute that a cubic inch would contain 3,375,000,000 of them—even in these inconceivably minute particles of matter, the same perfect symmetry of form, and the same relationship to light, existed that prevail in larger bodies, and an image of the window, perfect as in a convex mirror, was produced!

From these experiments we can draw no other conclusion but that the mercury in mercurial ointment is simply in a state of "*minute division*"—preserving unchanged its *fluidity* and even *metallic lustre*. The dull leaden hue first observed is not inconsistent with this conclusion, as the direct light was reflected by the upper glass, and thus prevented from reaching the mercurial globules as completely as when, in the second experiment, the paper was interposed. The parts of the disc free from globules exhibited the appearance of crowded striated crystals in every possible position. On examining some fresh lard, I imagined that its crystals appeared considerably larger than those in the ointment, but have left this part of the subject for further investigation.

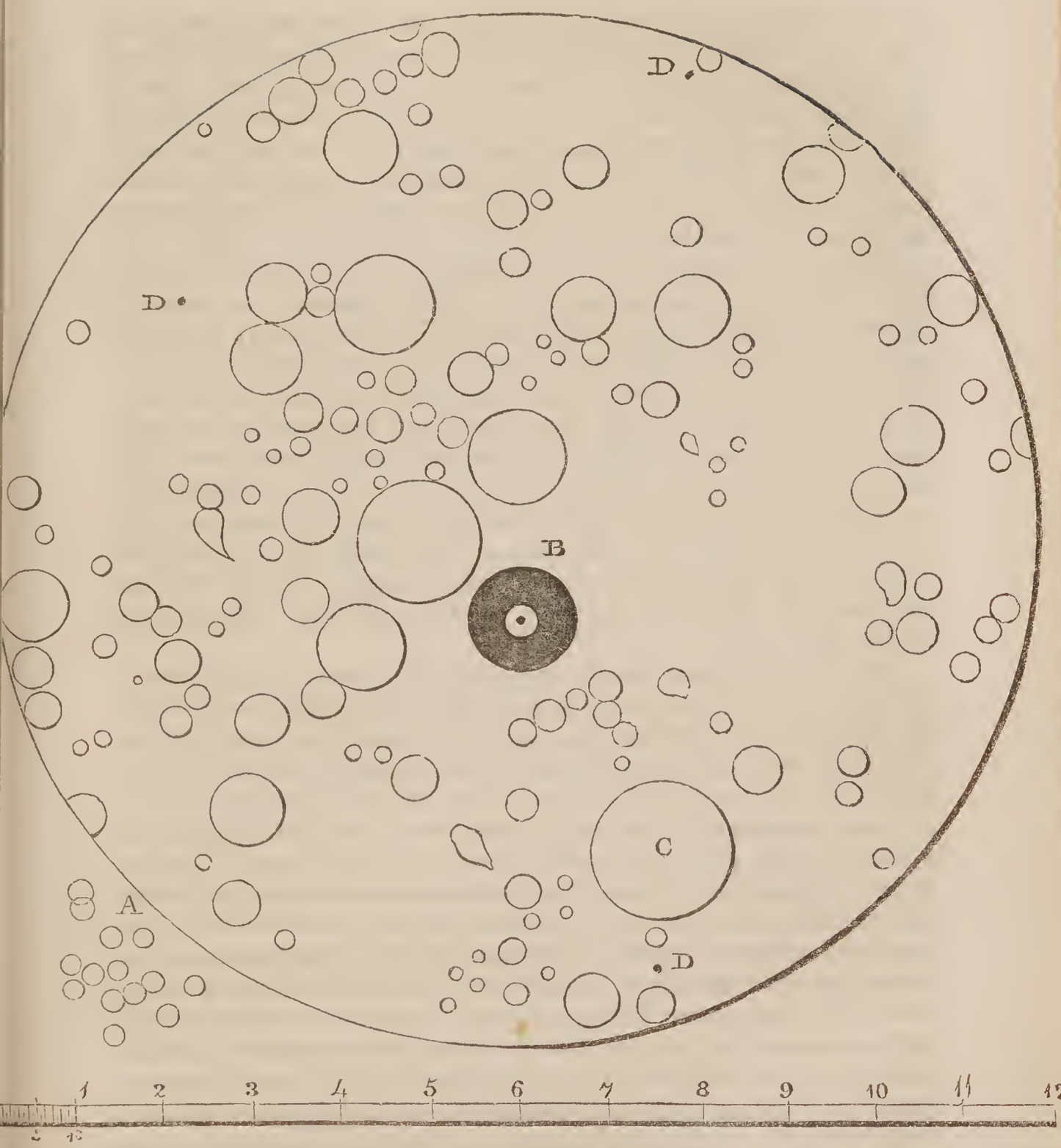
The sketch which I send you gives the *relative size* of every globule seen upon the field of view, and has underneath a scale by which their *absolute size* may be measured, even to the 20,000th part of an inch. Thus the largest, *C*, has a diameter of .00155 of an inch, whilst the smallest, *D*, does not exceed .0001. To form some idea of the extreme minuteness of the latter, it will only be necessary to state, that to count a cubic inch of such at the rate of one per second, would require an uninterrupted period of 31,796 years. Even this, however, fails to convey to the mind a correct perception of the capabilities of the microscope in making such fragments of matter visible, I have therefore, pasted upon the disc a small piece of white paper, surrounded with a black margin, and having for its centre a black *speck*—as will be seen at *B*. This speck is as nearly as possible the absolute size of the particle of ointment, upon the magnified image of which it is placed—in fact, is *rather larger*. Outside the sketch, at *A*, are figured some human blood globules, magnified upon the same scale as the disc itself. By comparison with these, it will appear that fully one-half of the mercurial globules are about the same size or under.

I am, Sir, with respect,

Your obedient Servant,

J. GRATTAN,

Apothecary and Chemist.



Thousandths and Ten Thousandths of an Inch.

ON MERCURIAL OINTMENT.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Newcastle on Tyne.

Sir,—A paper was read at the Pharmaceutical Meeting, and reported in the Journal of January last, on the State of Mercury in the Ointment. Mr. Dallas expressed his opinion that it exists

in the metallic state dissolved in the fat. Few will agree with him. I consider the question is in a great measure set at rest by the researches of Mr. Donovan; and think, with Dr. Paris, they show, that, in the officinal ointment, the mercury exists in two different conditions—in the state of metal *mechanically mixed*, and in that of an oxide *chemically combined* with the lard, and that the medicinal activity of the ointment exclusively resides in the latter portion, the presence of metallic mercury not only being useless but injurious, by obstructing the absorption of the active compound of the oxide. Mr. Donovan accordingly formed a direct chemical combination, by continually agitating together lard and black oxide of mercury, at the temperature of 350° Fahr., for two hours. At the end of the process, it appeared that every ounce of lard had dissolved and combined with twenty-one grains of oxide; and from the trials which have been made respecting its activity, it would seem to be as efficient as the officinal ointment, and moreover that it may be introduced by inunction in one-third of the time. See further in the *Pharmacologia*, 4th Edition, 1820, p. 569, *et seq.* In p. 573, he enlarges on the subject, when treating of the "*Unguentum Oxidi Hydrargyri Cinerei.*"—E.

These observations accord with what fell from Dr. Thomson, as reported in a contemporary journal, that the ointment prepared from the oxide is inefficacious, *unless properly prepared.* They also agree with the experiments of Dr. Christison in his valuable Dispensatory, page 500, where he says, "In mercurial ointment as thus prepared (*i. e.* by machinery), the metal is not merely in a state of fine division, but is also in part oxidated. Contradictory statements, however, have been made on this point, and the question is not yet settled, although the correct mode of preparing the ointment probably depends on it. More than twenty years ago, Mr. Donovan proved that four-fifths of the mercury in mercurial ointment is superfluous; for when this was removed by subsidence in the melted ointment, the superior stratum, containing only one-fifth of the original mercury, was found, by extensive trials, to be as energetic as ever in exciting mercurialism. But he further inferred from various facts—not however conclusive—that a part at least of the mercury in the upper stratum exists in a state of oxide. M. Guibourt, who has more recently investigated the subject, arrived at a different conclusion; for he found that not more than a 500th part of the ointment consists of a compound of oxide of mercury with a fatty acid." ("The small proportion he found may be accounted for, if he made his ointment, by his own process, by which the degree of trituration and length of exposure are materially reduced," page 501). Mr. Watt has arrived at a somewhat similar result,

having repeatedly found, as he conceives, no oxide at all in the ointment of the shops. (*The Chemist*, No. 13). I have examined various samples during the last eight years, and have never failed to detect a sensible portion of oxide. On maintaining the ointment for thirty-six hours in a state of fusion and at rest in a long tube, there is obtained a short column of mercury at the bottom, and a long super-stratum of yellowish, almost perfectly transparent oil. Even when this is filtered for greater security, it becomes intensely black with sulphuretted hydrogen; and if agitated with successive portions of diluted acetic acid about the temperature of 150°, an acid liquor is obtained which gives a copious black precipitate of sulphuret of mercury with the same reagent. It is evident from these results that mercury must be present in the form of oxide combined with a fatty acid; and calculating from the weight of sulphuret obtained, the oxide amounts to a trifle more than one per cent. of the ointment, and consequently to a fiftieth of the mercury used in preparing it.

From these remarks of Dr. C., in conjunction with the preceding, it appears evident that oxide of mercury is soluble in fat or a fatty acid, and that Dr. Thomson's observations, reported in *The Chemist* for January, are correct.

The proneness to decomposition of the black oxide of mercury will, in a great measure, account for the smallness of the quantity obtained from the ointment—light and air, at common temperatures, being sufficient to affect the change, when in a separate state.

I am, &c.

January 17, 1844. An Associate P. S.

[A Correspondent who subscribes himself "Hg. O." regrets not having been present at the last evening meeting of the Pharmaceutical Society, when the subject of mercurial ointment was discussed, but suggests the fitting-up of an apparatus for making the ointment *in vacuo*, as the best means of determining whether atmospheric oxygen plays any part in the process.

A Correspondent (Manchester) has also sent a communication on the subject, but we think, if he will peruse the foregoing articles, he will agree with us that the publication of his letter is unnecessary.—Ed.]

ON AUCKLANDIA COSTUS.

In the nineteenth volume of the *Transactions of the Linnæan Society*, is an interesting paper, by Dr. Falconer, entitled, "*Some Account of Aucklandia, a new genus of Compositæ, believed to produce the Costus of Dioscorides.*" The author observes, that

"The medicinal root celebrated among the ancients under the name of *Costus*, has long been a disputed point among botanical writers. Linnæus, upon no good grounds, conjectured it to be produced by the *Costus Arabicus*,

which opinion appears to have been first disproved by Jacquin. Sprengel, in his *Commentaries on Dioscorides*, states, that the Arabian *costus* was not so designated from growing in Arabia, but because it was imported from India into that country. He does not, however, hazard a conjecture about the plant which produces it. Professor Royle, in his *Illustrations*, gives the history of the *costus*, as found in the works of the Persian Hukeems, and correctly infers, that the "*putchuk*" of the Calcutta bazaars is the same as the Arabian *costus*. He throws out a hint that the root might be the produce of an umbelliferous plant."

That the root of *Aucklandia Costus* is the *Costus Arabicus* of the ancients, is supported on the following grounds:—

1st. It corresponds with the descriptions of the *costus* given by the ancient authors. 2d. The coincidence of the names: in Cashmere, the root is called *kŏot*, and the Arabic synonym is said to be *kŏost*, both given as synonymes by the Persian Hukeems, and names by which the medicine is known in all the bazaars of Hindoostan Proper. In Bengal, the Cashmere *kŏot* is called *putchuk*; and it appears, by a note in Dr. Royle's *Illustrations*, that Garcias ab Horto gives "*pucho*" as the Malay synonym of *Costus Arabicus*. 3d. *Kŏot* is used at the present day for the same purposes in China, as *costus* was formerly applied to by the Greeks and Romans. 4th. The direct testimony of the Persian authors, that *kŏost* comes from the "borders of India," and that it is not a production of Arabia. 5th. The commercial history of the root gathered in Cashmere under the name of *kŏot*. It is collected in large quantities, and exported to the Punjab, whence the larger portion goes down to Bombay, where it is shipped for the Red Sea, the Persian Gulf, and China; a portion of it finds its way across the Sutluj and Jumna into Hindoostan Proper, whence it is taken to Calcutta, and bought up there with avidity, under the name of *putchuk*, for the China market."

*Aucklandia** *Costus* belongs to the natural order *compositæ*; tribe, *cynareæ*; sub-tribe, *carlineæ*, of De Candolle. It grows in immense abundance on the mountains which surround Cashmere. It is a gregarious herb, about six or seven feet high, with a perennial thick branched root, an annual round smooth stem, large leaves, and dark purple flowers. In Cashmere it is chiefly used for the protection of bales of shawls from worms. The Chinese burn the roots as an incense in the temples of their gods, and they also attach great efficacy to it as an aphrodisiac.

The roots are dug up in the months of September and October, when the plant begins to be torpid; they are chopped up into pieces, from two to six inches long, and are exported without further preparation. The quantity collected is very large, amounting, as far as Dr. Falconer could learn, to about 2,000,000 lbs. per annum. The cost of its collection and transport to a mercantile depôt in Cashmere, is about 2*s*. 4*d*. per cwt. The commodity is laden on bullocks, and exported to the Punjab, whence it finds its way to Bombay, and a portion goes to Calcutta. Immediately before it enters the Company's territories, the value is enhanced, at Jugadree on the Jumna, to about 16*s*. 9*d*. or 23*s*. 4*d*. per cwt. In the China market it fetches, according to the Canton price-lists, about 47*s*. 5*d*. the cwt.

* Named in honour of George Earl Auckland, late Governor-general of India.

MODE OF PREPARING PRECIPITATED CHALK AND PURIFIED CHARCOAL.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

17, *Regent Street, Westminster.*

SIR,—In your last number of the PHARMACEUTICAL JOURNAL, allusions are made to the article CRETA PRÆCIPITATA, and as a form for preparing that article may be serviceable, I have ventured to give the following as a good and easy method, producing at the same time another valuable article,

PURIFIED ANIMAL CHARCOAL.

Take of Animal Charcoal, five pounds.
Hydrochloric Acid, four pounds.
Sesquicarbonate of Soda, three pounds six ounces, or
Carbonate Soda, five pounds.
Boiling Water, three gallons.

Mix four pints of the water with the hydrochloric acid, pour it on the charcoal, stirring with a glass rod during the effervescence, add four pints more of the water; stir well up, and filter the solution of hydrochlorate of lime from the charcoal, well wash the charcoal, and dry without, or with very *little*, heat.

Dissolve the soda in the remaining two gallons of water, filter the solution, to which add the solution of hydrochlorate of lime, well wash the precipitate, and dry with a gentle heat.

Produce Precipitated Chalk, one pound twelve ounces.
Animal Charcoal, pure, three pounds four ounces.

I am, Sir, yours, &c.

W. WOOLLEY.

CERATUM CRETÆ COMPOSITUM.

(Communicated by L. F. B., Manchester.)

℞ Emp. Plumbi, ℥vij.
Olei Olivæ, f℥iv.
Cretæ Preparatæ. ℥iv.
Aceti Destillati, f℥iv.
Liquoris Plumbi Diacetatis f ℥iv.

Pharmacopœia Mancuniensis.

A SIMPLE METHOD OF ASCERTAINING WHETHER PAPER BE DRESSED WITH (VEGETABLE) MUCILAGINOUS OR (ANIMAL) GELATINOUS SUBSTANCES.

BY BOETTGER.

THE vegetable substance used for dressing paper, is a preparation of starch, which is of course readily detected by an aqueous solution of iodine. I mention this well-known fact, because I was astonished to find that all the finer sorts of letter-paper and of smooth writing-paper, especially those made by machinery, are all rendered blue by this solution. The older specimens of paper, and those made in Holland, are all dressed with size. An aqueous solution of iodine may therefore be introduced as a blue sympathetic ink, to write on all the smooth and finer varieties of paper, which may again be rendered serviceable as tests for iodine.—*Annalen der Chemie und Pharmacie*, Band xlvii., Heft. 3.

RESEARCHES ON *AQUA REGIA*,

AND ON A PECULIAR

PRODUCT TO WHICH IT OWES ITS PRINCIPAL PROPERTIES.

BY M. BAUDRIMONT.

Although *aqua regia* has been known for many centuries, and is a substance in constant use, yet its constitution has been made the subject of but few chemical investigations. It has been generally thought that it owes its property of dissolving gold to the presence of free chlorine; yet, in 1831, Mr. Edmund Davy published a paper, tending to show that the active product of *aqua regia* is a peculiar gas, formed of equal volumes of chlorine and binoxide of nitrogen, uncondensed. He states, that this gas has a specific gravity of 1.759, and he has given it the name of *chloro-nitrous gas*. The method pursued by Mr. Edmund Davy for obtaining this gas, consisted in putting together fused chloride of sodium, or of potassium, and concentrated nitric acid. The nature of the ingredients thus reacting on each other, and the composition of the *chloronitrous gas*, would clearly indicate that it must be impossible to obtain this gas unmixed with chlorine, as the following equation will show:

$$4\,N\,O_6\,H + 3\,Cl\,Na = 3\,N\,O_6\,Na + N\,O_2,\,Cl_2 + Cl.$$

The presence of chlorine in this assumed gaseous product of *aqua regia*, rendering it impossible correctly to determine its properties, I thought it desirable to institute some new researches on the subject. It is the result of these researches that I am now about to communicate.

When a mixture of two parts, by weight, of nitric acid, and three parts of hydrochloric acid of commerce, is heated, a red gas begins to be disengaged as the temperature rises to about 185° Fahr. If this gas be passed through a tube bent like the letter U, the outside of which is surrounded by pounded ice, it will be deprived of what is condensible, which ought to be separated. Experience has shown, that the first portions of gas are mixed with hydrochloric acid gas, and that the subsequent portions alone are sufficiently pure for examination.

This gas does not in the least redden litmus paper when quite dry; but after some hours, it decolourizes it: when moist, it reddens it.

At 32° Fahr., water dissolves 0.3928 of its weight, or 121 times its volume. This liquor is of a bright red; its specific gravity is 1.1611. Contained in a tube hermetically sealed, it is not discoloured by the prolonged action of the sun's rays. In other respects, it possesses all the known properties of *aqua regia*.

The gas of *aqua regia* attacks many metals, such as gold and platinum. Arsenic and antimony, when powdered, burn with the emission of light, when thrown into this gas; but it is a singular fact, that it exercises no sensible action on phosphorus, even when the latter is introduced in a state of fusion.

The active product of *aqua regia* does not combine directly with metallic oxides; it affords a chloride and a nitrate, by a reaction easily understood. The quantity of chloride formed always surpasses that indicated by theory; that is to say, there are two equivalents to one of nitrate—no doubt in consequence of the gas decomposing the nitrates, and transforming them into chlorides.

When the gas of *aqua regia* is introduced into a narrow tube, plunged into a freezing mixture of salt and powdered ice, it liquefies.

The liquid product has a bright red colour, but not so deep as that of hypochlorous acid. It enters into ebullition at a temperature of 18° Fahr.; its specific gravity, at 46°, is 1.3677. Its coefficient of dilatation, measured above its boiling-point in sealed tubes, increases very rapidly;

Between 0° cent. and + 6° cent. it is 0.0020091.

" + 6.4 cent. and +18°.4 cent. it is 0.0035648.

Introduced into a tube of twelve millimetres diameter in the interior, containing another tube of 3.25 millimetres exterior diameter, and 1.20 millimetres interior diameter, the difference of the two levels of the liquid, at a temperature of 86°. Centigrade, was = 5 millimetres.

Numerous attempts were made to determine the refractive power of this liquid, also its specific heat, and the latent heat of its vapour; but the results obtained were too imperfect to warrant their publication.

The specific gravity of the red gas of *aqua regia*, taken in two different ways, was about 2.49.

The liquid attacks all the metals that are put in contact with it. With silver in powder, obtained by the reduction of the chloride of this metal, it occasions an explosion, and immediately disappears. It evaporates without attacking phosphorus.

The active product of *aqua regia* appears from analysis to be formed of nitrogen, oxygen, and chlorine, in the following proportions :

Nitrogen.....	0.126	175 =	N.
Oxygen	0.224	300 =	3 O.
Chlorine	0.650	885 =	2 Cl.
	1.000	1.360 =	$N O_3, Cl_2$.

The composition of this product indicates that it might be represented by a formula similar to that of anhydrous nitric acid, for $N O_3 O_2$, is similar to $N O_3 Cl_2$. This being the case, and taking as a precedent the case of *chloro-sulphuric* acid, I propose to call this body *chloro-azotic acid*, although in reality it is not an acid, as it does not saturate bases. One equivalent of chloro-azotic acid corresponds to six volumes of the vapour.

The liquefaction of chloro-azotic gas, the point of ebullition of the liquid, its direct solubility in water, and its action on metallic oxides, indicate very evidently that this body is of a peculiar and well-defined nature, and that its composition corresponds with that of the hypothetical anhydrous nitric acid. —*Journal de Pharmacie.*

PROCESS FOR OBTAINING OXIDE OF ZINC BY PRECIPITATION.

BY M. E. DEFFERRE.

In preparing oxide of zinc by combustion, it is important to adopt certain precautions, without which it is impossible to obtain it in a state of purity. It almost always happens, that the first portions of oxide that are formed have a yellowish red colour, from the presence of iron in the zinc of commerce, and sometimes even from the presence of oxide of cadmium. This portion of oxide should be carefully separated, and that next formed will be perfectly white, and in the form of light flocks of wool ; but in attempting to remove this from the crucible, by means of a small iron ladle, it is difficult to avoid taking up with it some of the unoxidized metal, which continues to burn after being taken out of the crucible, so that the product is of a grayish white colour, more dense than before, and always contains particles of metallic zinc. The Codex of 1818 contains a process, by precipitation, which consists in decomposing pure sulphate of zinc by carbonate of potash, and afterwards decomposing the carbonate of zinc thus obtained, by calcining it in a crucible. M. Soubeiran, in his excellent *Traité de Pharmacie*, in describing this process, recommends Wackenroder's method of obtaining sulphate of zinc in a state of great purity.

The process I have adopted is easy of execution and inexpensive ; which recommendations may perhaps induce some Pharmaceutists to prepare some of the oxide for themselves.

Take of	Sheet Zinc	125	parts
	Hydrochloric Acid	500	"
	Nitric Acid.....	8	"
	Carbonate of Lime	8	"

Dissolve the zinc in the hydrochloric acid with the aid of a gentle heat; then add the nitric acid to peroxidize the iron which commercial zinc always contains, and evaporate the liquor to dryness; afterwards dissolve in water, add the carbonate of lime, leave these in contact for twenty-four hours, and filter; the liquor being thus obtained quite clear and colourless, precipitate the oxide with a sufficient quantity of *liquor ammoniæ*, added in small quantities at a time until the precipitation ceases; this precipitate being carefully washed, is to be afterwards dried in a stove moderately heated.

This process, which is shorter and less expensive than any other that I know, always affords a good product. The oxide thus obtained is very white, very light, without taste or smell, entirely soluble in acids, forming a colourless solution; also entirely soluble in solutions of the alkalis.

It is advisable, in precipitating the oxide, to add the ammonia in small quantities at a time, and only so long as a precipitate is formed. As this precipitate is soluble in excess of the alkali, in case too much of the latter should be used, the liquor should be heated, so as to drive off the excess, when the oxide will be again deposited.—*Journal de Pharmacie.*

[We have inserted the above article, as it may probably be published in some other journals in this country, although we cannot recommend the process, the product being, not a pure oxide of zinc, but a basic chloride or oxichloride. It differs from the oxide of zinc of our Pharmacopœia, in containing chlorine and water. We are anxious, therefore, to caution our readers against the substitution of this for the pure oxide, and to point out the necessity of testing the oxide of zinc supplied by manufacturers for chlorine, as well as carbonic and sulphuric acids, and water. In a paper read before the Pharmaceutical Society twelve months ago,* it was shown that the substance supplied in commerce under the name of oxide of zinc, was generally either a basic carbonate of zinc, containing thirty-three per cent. of carbonic acid and water, or a basic sulphate of zinc, containing thirty-six per cent. of sulphuric acid and water. If made according to M. Defferre's process, the product would resemble the latter of these, with the exception of its containing chlorine instead of sulphuric acid.

The use of either of these substitutes for the pure oxide of zinc ordered in the Pharmacopœia, is quite unjustifiable; yet notwithstanding the fact that, twelve months ago, the essential difference between the oxide of zinc supplied by the manufacturer, and that ordered by the College of Physicians, was pointed out, we understand that the impure article is still very generally supplied to the trade. Some manufacturers, however, now make it according to the instructions of the College.

Every dispensing Chemist, therefore, ought to examine his oxide of zinc in the following manner:—Dissolve some of the oxide in pure nitric acid, dilute the solution with water, and divide the mixture into two parts; to one add solution of chloride of barium or nitrate of baryta, to the other solution of nitrate of silver. If any effervescence takes place during the solution of the oxide in the nitric acid, or if a dense precipitate be occasioned by either of the re-agents, the specimen should be considered as impure, and rejected.—Ed. Pharm. Journal.]

* See Pharmaceutical Journal, vol. ii., p. 506.

APPLICATION OF THE ELAÏOMETER,

FOR THE

DETERMINATION OF THE PURITY OF OIL OF SWEET ALMONDS.

BY M. GOBLEY.

Sweet oil of almonds is nearly as much used by the Pharmaceutist as oil of olives ; but there is this difference between these two oils, that we are obliged to depend on commerce for one, while the other may be prepared in our laboratories. Yet there are few Chemists who prepare even the oil of almonds, as it is difficult to do so economically, and powerful and expensive presses are required for the purpose.

The oil of almonds of commerce is frequently mixed with oil of poppy-seeds, and sometimes, according to M. Leroy, a *pharmacien* of Brussels, to the extent of more than one-half its weight. When adulterated to so large an extent as this, the white colour, the fluidity, the smell, and taste which oil of poppy-seeds communicates, render the presence of the latter easily detected ; but the detection is not so easy when the proportion of oil of poppy-seeds is small. I have found, however, from experience, that this adulteration may be detected by means of the *elaïometer*, an instrument which I have proposed for determining the purity of olive oil.

There are in commerce two kinds of sweet oil of almonds ; one obtained by the expression of unblanched bitter almonds ; the other obtained from the blanched sweet almonds. The latter of these is less coloured than the former, and would be always preferred if it did not present the inconvenience of becoming more easily rancid. My experiments have been tried on these two kinds of oil, one of which I prepared in my laboratory, and the other I obtained from M. Chardin, one of our most conscientious perfumers. I have also tried a specimen of oil which M. Soubeiran was good enough to supply me with, and which was prepared at the *Pharmacie centrale*, from unblanched bitter almonds. All these oils, when fresh, mark a little above 38° ; that is, from 38° to 38½°, at 55° Fahr. ; while olive oil, at the same temperature, marks 50°. Oil of almonds is therefore rather more dense than olive oil.

If the oil be old, it marks a little below 38° ; for rancidity augments the density of oil of almonds, as well as all other oils ; and therefore rancid oil might, from the indications of the *elaïometer*, be erroneously supposed to contain oil of poppy-seeds. The oil should be tasted before trying its density, and rejected if it leave any sensation of rancidity.

All that I have said in a former paper, on the method of testing olive oil by means of the *elaïometer*, is applicable to the testing of oil of almonds.

Oil of almonds, like olive oil and oil of poppy-seeds, is dilated to the extent of 4°.5 of the *elaïometer*, for every increase of temperature equal to one degree of Reaumur's scale ; or 3°.6, for one degree of the Centrigrade scale.

Thus the admixture of oil of poppy-seeds with olive oil or with oil of almonds, may be detected by the *elaïometer*.—*Journal de Pharmacie.*

UPON TWO NEWLY-DISCOVERED METALS, ERBIUM AND TERBIUM, OCCURRING ALONG WITH YTTRIA.

BY C. G. MOSANDER.

In making some researches upon yttria, the author unexpectedly discovered that (as in the instance of oxide of cerium) what Chemists had heretofore regarded as yttria was not a simple oxide, but a compound of at least three oxides whereof two were previously unknown.

The distinetive charaeters of these oxides are as follows :—

1. Although more powerful saline bases than glucina, they are insoluble in water and in caustic alkalis: still, after being exposed to a strong heat they dissolve in a boiling solution of carbonate of soda; nevertheless, after the lapse of some days, the greater portion separates from the solution as a double salt.

2. In union with earbonie aeid these oxides are very soluble in a cold solution of carbonate of ammonia, and when saturated, there begins immediately to separate a double salt, eomposed of their carbonates together with carbonate of ammonia, to sueh an extent, that after some hours, very little oxide remains in the solution.

The salts of these oxides have a sweet taste. The sulphates are more difficultly soluble in warm than in cold water ; they form double salts with sulphate of potash, whieh are insoluble in a saturated solution of that sulphate.

If the name of *oxide of yttrium* be reserved for the most powerful of these bases, the next in order may be termed *oxide of Terbium*, and the weakest, *oxide of Erbium*. They present the following charaeteristie differences :

Nitrate of yttria is so deliqueseent, that if a small quantity of a solution of this salt be allowed to stand during some weeks, in a warm place, the salt formed is not free from moisture. The solution of nitrate of oxide of terbium is of a pale reddish hue, evaporates readily, and leaves a radiated crystalline mass, which suffers no change even in a very damp situation. The crystals of sulphate of yttria are colourless and remain, in an atmosphere of a temperature of from 86° to 158° Fahr., clear and transparent ; whereas a solution of sulphate of oxide of terbium leaves, upon evaporation at a low temperature, a salt which directly effloresces to a white powder. The oxide of terbium, of which the salts have a reddish tint, is, in a state of purity, colourless like yttria.

Oxide of erbium differs from both the above, inasmueh as, upon being heated in the air, it assumes a deep orange hue, which it again loses on being heated in hydrogen gas, together with a trifling loss of weight. It is to the presence of oxide of erbium that yttria owes its yellow colour, as heretofore prepared; the so-called colourless yttria being chiefly glueina.

Sulphate and nitrate of oxide of erbium are void of colour, although the solutions of the oxide in acids have frequently a yellow tint. The sulphuric salt does not effloresee.—*Poggendorff's Annalen*, 1843, No. X., p. 311.

REVIEW.

THE LONDON DISPENSATORY. By ANTHONY TODD THOMSON, M.D., F.L.S. TENTH EDITION. *Longman, Brown, Green, and Longmans.*

THIS work has had probably a more extensive circulation among Chemists and Druggists than any similar publication in this country. It has passed through ten editions in little more than thirty years, which may be taken as an indication of the estimation in which it has been deservedly held by the profession. As a work of general reference on matters connected with the practice of Pharmacy, it ranks undoubtedly among the first of

its kind; it is also well calculated, from the quantity as well as the arrangemeut of the matter, to furnish the student with a systematic view of the leading principles and facts, a knowledge of which is required by the Chemist and Druggist. It would be superfluous to give a lengthened analysis of the plan and substance of a work with which we presume that most of our readers have long been acquainted; but since it is probable that some do not possess it, we may observe, that the first part of the work, which treats of the Elements of Pharmacy, contains within a small compass, much useful matter for the student, as well as many tables to which the Pharmaceutist has frequent occasion to refer. This, together with the third part, on the Preparations and Compounds of the Pharmacopœias, relates to the department of Practical Pharmacy, and contains general instructions respecting the several processes and operations of the shop or laboratory. The perspicuity and practical nature of this somewhat elementary information gives much value to the work as an introduction to the study of the Pharmacopœia, and the formulæ of the three colleges of London, Edinburgh, and Dublin are placed in juxtaposition, interspersed with comments by the author, which arrangement is particularly adapted to the convenience of the dispensing Chemist.

The Materia Medica, which is the second part, occupies 654 pages. The substances here described are those only which are met with in commerce, and employed in medicine in this country. It is not, therefore, a complete history of drugs; had it been so, the size of the book would necessarily have been greatly increased; yet it comprehends the information most required by the dealer in drugs and dispenser of medicines, and the length of the several articles is generally regulated by the comparative importance of the substances treated of as therapeutic agents—those possessing little or no utility being passed over in a more cursory manner.

Much new matter has been added to this edition; among which is a list of the authors quoted, and an index of synonymes for facilitating a reference to substances described in the book, under names not generally used or understood in this country. This latter list is intended to assist the dispenser, in reference to foreign prescriptions, which, in the absence of some appropriate work of reference, are sometimes found perplexing to the English student.

The size of the book has been increased from 1164 to 1316 pages, and the descriptions of some of the articles of the Materia Medica, on which recent discoveries have thrown fresh light, have been re-written or enlarged accordingly.

TO CORRESPONDENTS.

Concentrated Syrup of Senna.—Mr. Coleby informs us, that the "concentrated syrup of senna," which he made "ten years ago," was copied from a similar preparation prepared by Messrs. Southall of Birmingham. He adds, that "it was a highly concentrated infusion of senna, thickened with treacle, and flavoured with essence of lemon."

(NOTICE.)

[Mr. Freeman having considered himself aggrieved by the non-insertion of his letter forwarded to us last month, on the *Syrupus Sennæ Concentratus*, we think it right to explain the practice which we adopt on such occasions. We are at all times glad to receive from Correspondents, and to insert in the body of the work, communications containing information as to the nature, constitution, qualities, or mode of preparation of any remedial agent, or any other matter relating to our profession which is likely to interest or instruct our readers; but we consider that letters written for the purpose of recommending secret proprietary medicines are not suited to the pages of a scientific journal. We departed from our usual custom by inserting the letter of Messrs. Smith, of Edinburgh, because we had discovered that these gentlemen were compromised by a remark accidentally introduced in our previous number, and that they were consequently entitled to redress. As Mr. Freeman's letter was merely intended to recommend his preparation, which had not previously been alluded to, and to claim priority of introduction, while the only information which he has given us as to its composition has been that it differs from that which is sold in Edinburgh under another name, we acted in his case according to our usual custom. The letter will be found among the advertisements of this number.—Ed.]

"Copahine-Mege (Lozeau)—Dragées et Pastilles de Lactate de Fer (Gelis et Conté)."—Dr. Berriere Fontaine has written a letter recommending the above preparations, which he informs us he has prescribed with advantage. The former is in the form of a lozenge, or sugar-plum, being a resinous preparation of Copaiba, covered with dextrine and sugar. The latter is lactate of Iron exhibited in a similar form. We cannot publish the letter entire for the reason stated in the above notice.

B. R. (Glasgow), a reader of the Journal, wishes for an explanation of the terms, "*exhaust* it with boiling water by *displacement*," and "concentrate the infusion *in vacuo*," which terms are used by Professor Christison in his description of the process for making the "Fluid Extract of Senna." [We must refer our Correspondent to vol. i, Nos. 1, 2, and 4, of this Journal, where he will find the information he requires].

Mr. Marks gives the following formula for Conf. Ferri. Comp., in answer to the inquiry of a Correspondent (J. G. of Bath), in our last number; but we are unable to say whether this be the formula required:

℞ Ferri Subcarbonatis,, ℥ss.
Theriacæ q. s. Misce.

R. G. M. (Manchester), wishes to know why the mercury becomes reduced to the metallic state in Ung. Hydr. Nitr., when the ointment has been kept for some time. [We presume this arises from the oxidation of the fat at the expense of the oxygen with which the mercury was previously combined.] Our Correspondent also refers to another instance, besides that alluded to in our last number, in which Mr. Rennie in his *Dispensatory*, or *Supplement to the Pharmacopœias*, exemplifies the extent of his practical acquaintance with the subjects on which he treats: Mr. Rennie, in describing castor oil, says, "adulterated most commonly with about a fourth part of oil of almonds"

(the cheapness of which must render it an advantageous substitute), "and frequently also with linseed, olive, and poppy oil. When the adulteration with other oils is carried to any extent, *some of the stronger purgative tinctures that have least colour, are added to keep up the deception.*" *!!!*

"EGOMET."—(1.) An iron knife discolours Ung. Hydr. Nitr., by abstracting a portion of the acid, and causing a reduction of the mercury.—(2.) The specimen sent appears to be a fair sample.—(3.) When sulphuric acid is added to a strong solution of iodide of potassium, sulphate of potash is precipitated.—(4.) See vol. ii, No. 8.

Mr. BURGESS reminds us that the use of cyanide of potassium for the removal of the stains of marking ink, was first suggested by him in his paper on Marking Inks, published vol. i, No. 8, page 314.

"AN APPRENTICE."—A solution of isinglass or gelatine should be applied to paper labels or drawings before varnishing them.

"A MEMBER."—The last Pharmacopœia was published in 1836.

We have received a long communication from "A. P. S.," on the solubility of sulphate of potash. The writer concludes that when sulphate of potash and carbonate of soda are mixed in solution, the salts may be, and are, decomposed, but nothing further; or, that combination does not follow the decomposition, and that, in fact, we have in the solution sulphuric acid, potash, carbonic acid, and soda, but at the same time they are so far within the circle of each others attraction, as to prevent their forming any new combinations." [We think it unnecessary to publish the letter, which is merely theoretical].

S. E. P.—1. The nitrous acid of commerce resembles the nitric acid of the Pharmacopœia, in being a mixture of nitrous and nitric acids, but differs from it in containing a larger proportion of nitrous, and a smaller proportion of nitric acid.—(2.) The sesquisulphate of potash was accidentally obtained by Mr. Phillips in fusing potash with sulphuric acid; the conditions necessary to its formation are not clearly understood.—(3.) We have accidentally mislaid the sample.—(4.) Pure carbonate of soda may be obtained by submitting the bicarbonate to a red heat, so as to drive off the second equivalent of carbonic acid.

"AMICUS."—(1.) See vol. i, Nos. 1 and 4.—(2.) Put it over a lamp.—(3.) The addition of caustic alkalies to the grease applied to the wheels of railway carriages, is, we should think, intended to prevent the oxidation of the metal.—(4.) Our Correspondent wishes us to recommend him a *concentrated essence* of classical education. [We regret our inability to do so, but advise the employment of a classical tutor].

M.P.S.—(1.) Indian rubber may be dissolved in naphtha by the aid of heat; but there are some kinds of naphtha met with in commerce that do not answer for this purpose.—(2.) The methods of obtaining chloric ether and oxide of tin, will be found described in any work on Chemistry.

"INQUISITOR" (Barnsley).—An Argand oil lamp is commonly used with the microscope. For the means of obtaining oxygen gas and laughing gas, we must refer to some work on Chemistry. For the former, see also vol. ii., page 364.

"SOFT SOAP."—(1.) The price of Christison's Dispensatory is 18*s*.—(2.) Maw Seeds are the produce of the garden poppy.—(3.) No.—(4.) By the use of acids and heat.

R. AND D. (Plymouth) will find the meaning of the terms alluded to in Hooper's Medical Dictionary, or any similar work. Nitrous acid contains one equivalent less of oxygen than nitric acid.

J. W.—We doubt the propriety of inserting the formula.

"INQUISITOR CHEMICUS" (Plymouth).—We cannot recommend the substitution of any other colouring agent than that ordered in the Pharmacopœia for Compound Tincture of Cardamoms. The red prussiate of potash may be made by passing chlorine gas through a solution of ferrocyanide of potassium. (For details, see Fresenius's *Chemical Analysis*, page 48.)

"CHEMICUS."—Proprietary medicines are not exempted from the stamp on account of the price being less than a shilling. The law states—for any price not exceeding one shilling, a stamp of three half-pence is required.

"ZENO." — Barbadoes Aloes is generally said to be more drastic than Socotrine. Aloë Spicata is the species ordered in the Pharmacopœia. In commerce no distinction is made between what is called Spike Aloes and Socotrine.

G. M., M.R.C.S.—(1.) The process of displacement is applicable to the preparation of concentrated infusions; these, however, are made only by individuals according to their own formulæ, which are not published.—(2.) See vol. i., Nos. 3 and 8.—(3.) The substances mentioned may be distilled either in stone or glass retorts.

E. W. is referred to the above.

G.F.S.—We are not aware of Ammonio-tartrate of Potash being used in medicine; it may be made by saturating bitartrate of Potash with Ammonia.

"EMETICUS" is anxious to know the best mode of procuring the vapour of hydrocyanic acid. [Uncork the bottle.]

C.S.—We decline to interfere respecting any private arrangements or differences between masters and assistants.

"AN ASSISTANT."—Persons desirous of admission into the PHARMACEUTICAL SOCIETY, should apply to the Secretary, 17, Bloomsbury Square.

"ZETA."—See vol. ii., No. 2, page 58, and No. 8, page 481.

Mr. SETCHFIELD wishes for the formula for ammonio-citrate of iron and quinine.

J. H. L. D.—We have already given several formulæ for marking-ink.

W. K. W. AND L. V. have sent shop-bills of a disreputable character. The parties are not Members of the Society.

"A CONSTANT READER."—(1.) The fact is new to us.—(2.) We think the formula not at all likely to answer.

"A COUNTRY MEMBER mentions instances in which Wholesale Druggists have supplied private individuals with drugs at wholesale prices. [A Wholesale Druggist known to be guilty of this practice, would be likely to lose his connexion in the trade.]

"M. MINOR."—A leaden worm ought not to be used for pharmaceutical distillation. The metal proper and generally used for this purpose, is tin. See vol. ii., pp. 355, 406.

B. R. has been victimized by a person dressed as a groom, representing himself as coming from the Archbishop of Canterbury, for isinglass on credit; and having heard that this has been done in other instances, thinks it right to publish this caution.

Advertisements to Mr. CHURCHILL, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. SMITH, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to THE EDITOR, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. IX.—MARCH 1st, 1844.

PHARMACEUTICAL EDUCATION.

Although it is, we believe, universally acknowledged, that the time has arrived at which increased facilities for improvement must be provided for the rising generation in our body, some difference of opinion may probably exist as to the manner in which this object should be effected, and the extent to which it is practicable to carry the desired measures. Considerable progress has been made during the last two years; but when we consider how comprehensive and difficult an undertaking is before us, we cannot fail to be aware that much more remains to be done, and that in order to accomplish it, we must not only persevere in our exertions, but these exertions must be made according to some fixed plan, which is calculated to spread the advantages in every district throughout the country.

We have commenced by founding a School of Pharmacy in the metropolis, which is flourishing to such an extent, that we may consider it fairly established. Similar institutions, on a smaller scale, have been founded in some of the large provincial towns, as branches of the parent Society; and reports of their several proceedings have been, from time to time, received and published. We have lately been favoured with a code of laws from the Bristol Branch of the Pharmaceutical Society, which are now nearly completed, according to the general principles recommended by the Council in their circular on the subject, published in our number for December last. A committee has been appointed, in whom is vested

the management of the local school, the lectures, evening meetings, library, and museum; and the regulations appear to us to be on the whole judicious and satisfactory, although we have not yet received authority to publish them. It is evident that our brethren at Bristol must have put their shoulders to the wheel with much zeal and industry, in effecting what they have already done; and we trust their example will have a good effect by showing the result of the abour of a few individuals, when directed into the proper channel. We have recently received communications from the secretary at Bath; from which it appears that similar measures are in steady progress in that city, the details of which will be officially reported in due course.

The secretaries at Manchester and Norwich have also given us a favourable account of the result of their labours in the formation of their respective libraries and museums, and in the arrangement of courses of lectures for the ensuing season.

We mention incidentally this information (which has come to us in the way of private correspondence) in order to show that the work is progressing in various quarters—that the measures which were commenced in the metropolis are gradually extending their influence to distant parts of the nation—and that the scheme which has been undertaken for the general improvement of our body, is practicable and easy of application in every district which is sufficiently populous, and in which our members are disposed to act with energy and perseverance. We could point out other localities where similar steps might advantageously be taken, but no arguments on our parts, no plan concerted at a distance, could be available, or indeed produce any effect, unless the want of an improved system be felt, and the disposition to labour in the undertaking be evinced, by those parties on whose individual and united exertions its success must depend.

The proposal to form a branch school should emanate from the district in which the want of it is felt, and in organising and completing the plan, reference should be made to the Council in London, whenever advice or assistance is required. But the

labour must be borne by the local committee, whose zeal in the cause will very much affect the amount of success and advantage resulting from the institution. Another circumstance necessary to ensure success is the co-operation of the junior members of our body, for whose benefit the schools are established, and this co-operation is likely to be secured to a greater or less extent, in proportion to the tact and judgment evinced by the committee in their arrangements.

It is of great importance that in all these branch establishments unity of design should be observed, and hence arises the necessity of acting in concert with the Council in their organization. The Pharmaceutical Chemists of this country having undertaken the government of themselves, in which undertaking the education of the junior members is a prominent and fundamental feature, it should be our object, not to form a number of isolated cliques or small societies, but to comprehend in one institution, organized according to a specific plan, a system of education which shall identify each branch with the parent society, and distribute the influence of the whole association among its various branches. In regulating the local privileges of each branch, the first consideration to be attended to is the welfare and improvement of the parties immediately concerned; and if strangers be admitted to any of these privileges, the terms and mode of admission should be such as to give Members, Associates, and Apprentices who subscribe to the Society, a decided advantage over others, and in all cases the management must be vested exclusively in the Members.

In reference to the Lectures, it is difficult to lay down any general rule either as to the number of courses, the length of each course, or the time of the day at which they are delivered, these details being in a great measure dependent on the numerical strength, pecuniary resources, and other circumstances in each particular district.

There are very few places in which facilities exist for the establishment of a complete and effective school of Pharmacy, but in

some cases where this would obviously be impracticable, a single course of lectures might occasionally be delivered with advantage, as a stimulus to the students, and in small towns where no lectures could be supported, the deficiency might be in some degree supplied by means of a small library of standard works.

In fact, in every town in which there are five or six Members and as many Associates, it would be found advantageous to unite in the purchase of a few of the most important works relating to our avocations, by which means each Member would have occasional access to works which would not otherwise be within his reach, and the Associates and Apprentices would in like manner enjoy increased facilities of improvement.

The chief obstacle which, in the first instance, presents itself to the establishment of a complete school of Pharmacy, whether in the metropolis or in any provincial district, is the difficulty of adapting the lectures to the convenience of the Associates and Apprentices, without trespassing on the domestic and business arrangements of their employers. The parties concerned having entered upon their situations without stipulating for the privilege of attending lectures, and their employers being therefore unprepared for an innovation of this kind, it is not at all surprising that some objection is raised against the neglect of business during two or three hours in the week, and that it is found impossible to arrange these hours in such a manner as to suit the convenience of all parties. But we trust that this is only an ephemeral difficulty. When it becomes generally known and understood that, in order to become qualified as a Pharmaceutical Chemist, a certain definite course of instruction is necessary in addition to the usual routine of the shop, the parents and guardians of young men who are preparing to embark in the business, will, as a matter of course, stipulate that they shall be allowed a certain time during their apprenticeship for reading or attending lectures; and those who during their apprenticeship have not had the opportunity of gaining as much information as could be desired, will avail themselves of the nearest district school, or, if convenient, will come to London for

a few months, to complete their education. This practice will tend in a remarkable degree to raise the character and qualifications of our young men, and to confer upon us, as a body, the rank which we ought to enjoy as followers of an occupation which should be considered no less a profession than a trade.

In Germany, France, Russia, and other continental nations, the course of education prescribed by law for the Pharmaceutical Chemists is rigidly enforced; and this education comprises a regular attendance on all the requisite courses of lectures, together with the practical study of the scientific department of the laboratory; and it is not at all improbable that some similar enactment will take place in this country. We cannot expect to arrive, by any sudden revolution, at the state of qualification which is enforced among our neighbours, but possessing, as we do, every facility for improvement which they can possibly enjoy, and possessing also as a nation a character for perseverance which it is desirable to sustain, we ought not to be diverted by any trifling difficulty from the great object which we have in view, and which we may eventually attain by steadily and consistently pursuing the course now before us.

So long as our lecture-rooms depend for support upon Associates and Apprentices who are subject to prior engagements with their employers, our courses of lectures must of necessity be limited, and the time of attendance must be regulated so as to interfere as little as possible with the hours of business; but when it has become the practice to devote a season exclusively to study, it may be desirable to comprise within a certain number of months our complete course of education, and to regulate the hours of attendance in such a manner as to occupy nearly the whole time of the students during that period. Nor should this education be confined to theoretical lectures; it should extend to practical and experimental researches in the laboratory, under the superintendence of the professors: and thus, we trust, our students will become qualified to pass an examination more strict and elaborate than that which is at present instituted, and will rival their continental brethren in the amount of their chemical and pharmaceutical knowledge.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

MINUTE OF COUNCIL.

At a meeting of the Council, held January 3d, 1844, it was *Unanimously resolved*,

"That the Council desires to record its deep and unfeigned regret at the loss which the Society has sustained in the decease of the late revered President, William Allen, F.R.S.

"Formed as the Society was for the public benefit generally, and for the welfare of that branch of the profession of medicine of which he was so distinguished a member, it was by universal consent that he was solicited to allow himself to be placed at the head of it, that under his wise and kindly superintendence its scientific and benevolent designs might be carried out.

"The Council is anxious to bear testimony to the zeal he ever manifested in all the concerns of the Institution, to the encouragement it has derived from his advice, whenever his health and numerous avocations enabled him to afford his presence or opinion; and it sincerely trusts that the same harmony which his beneficent spirit could not fail to infuse, will ever continue to pervade its own meetings, and the general intercourse amongst the Members."

At a meeting of Council, held February 7th, it was *Unanimously resolved*,

"That Mr. Charles James Payne be elected President, and Mr. John Savory, Vice-President."

It was also *Unanimously resolved*,

"That Mr. Ralph Stamper be elected a Member of Council, a vacancy having been occasioned by the decease of the late President."

On the evening of the 24th of January, 1844, was delivered a

LECTURE
ON MINERAL WATERS.

BY A. T. THOMSON, M.D., F.L.S., &c. &c.

The lecturer commenced his discourse by taking a general view of the nature of water; and demonstrating that, under no circumstances, even when distilled in the great alembic of Nature,

and precipitated from the clouds in the forms of dew, rain, and snow, was it procured in a state of absolute purity. He pointed out the distinction between common water, holding many substances in solution, and mineral water; and thence called in question the common definition of mineral water.

He divided mineral waters into five sections, namely, *acidulous waters*, *alkaline waters*, *saline waters* (including *thermal springs*), *chalybeate waters*, and *sulphureous* or *hepatic waters;* and exhibited specimens of each section—displaying, at the same time, the tests by which each can be recognised. He stated that the substances contained in the whole are either *simple* or *compound.* In the first division, containing the simple substances, are oxygen and nitrogen gases, sulphur, silica, alumina, and manganese: in the second, oxides of iron and of manganese; carbonic, sulphuric, and hydrochloric acids; carbonates of lime, of soda, magnesia, and iron; nitrates, phosphates, acetates, and silicates; besides, in a few instances, traces of animal and vegetable matters. The lecturer demonstrated, by experiments, that many of these substances were contained, even in considerable quantity, in water usually regarded as common water; and displayed the presence of free carbonic acid, carbonate of lime, sulphate of lime, chloride of sodium, and some other salts, in the common pump water of the metropolis, drawn from a depth of from sixty to ninety feet. He pointed out the impropriety of employing such water in compounding prescriptions that contain any of the following substances;—bicarbonate of potassa, sesquicarbonate of soda, chlorides of calcium and of barium, acetates of lead, tincture of sesquichloride of iron, iodides of iron and of potassium, and phosphate of soda.

The lecturer next referred all mineral waters to volcanic regions; and considered carbonic acid the chief agent which holds the salts they contain in solution. Indeed, so abundant is this gaseous acid in volcanic regions, that it is not confined to springs, but rises in the state of gas from the soil; and in some places, as at Marienbad, it is employed in the form of gas baths. He showed the mode of ascertaining the nature of any mineral water as far as regards its physical characters; namely, its transparency, colour, odour, temperature, and specific gravity; so as to shorten our future examination, by at once classifying the water, before commencing its chemical analysis.

Acidulous waters owe their acid properties either to carbonic or to sulphuric acid. When the former is present, the water sparkles in the glass when taken from the spring, or poured from a bottle; it reddens litmus only fugaciously; and when exposed to the air or boiled, it becomes turbid, and deposits some of its components which were held in solution by the acid. Such acidulous waters

are not found in England, but they abound on the Continent: they usually contain *lime*, *magnesia*, traces of *iron*, and occasionally chloride of sodium. The lecturer exhibited as a specimen of the acidulous waters, that of Ferdinandsbrunen, one of the Marienbad springs. It contains 55⅔ grains of solid matter, and fifty cubic inches of carbonic acid gas in the imperial pint. Its taste is refreshing, subacid, and, after it has been exposed to the air, slightly saltish. The lecturer here exhibited an apparatus well adapted for ascertaining the quantity of carbonic acid contained in any acidulous mineral water. It consists of a flask, into which a given quantity of the water is put, and a communication made between the flask and a tubulated bottle, containing barytic water with a little liquor ammoniæ. By keeping the flask at a heat under the boiling-point, until all the excess of gas passes over, and then boiling briskly for twenty minutes, the whole of the gaseous acid is obtained in combination with the baryta, forming an insoluble carbonate, the weight of which gives the amount of the acid in the mineral water. He next demonstrated by tests the presence of chloride of sodium, sulphate and carbonate of soda, carbonates of lime and of magnesia, traces of alumina, carbonate of iron, and carbonate of manganese in this water.

In all acidulous carbonated springs, the acid gas appears to have been united with the water under great pressure; but the fluid no sooner arrives at the surface of the earth, than the gas is disengaged with so much force as often to give the appearance of boiling to the springs. The solvent power of this acid is displayed in the formation of stalactites and stalagmites; and by the immense deposits of travertin, or lime-stone, from the water of many of the continental springs. At the baths of San Fillipo, a solid mass, thirty feet thick, was deposited in twenty years.

The acidulous mineral waters operate on the animal economy as excitants, elevating the nervous energy almost to intoxication: but this is of very short continuance. The salts contained in them enter the blood, and being carried to the kidneys, operate as diuretics; but they possess no solvent powers over the lithates or other calculi. They should not be employed in febrile conditions of the habit; as under such circumstances, they cause headache, confusion of ideas, and sleeplessness. The morning is the best time for drinking the acidulous water; the usual dose is from half a pint to a pint. In low conditions of the system, they may be mixed with wine, or bitter infusions, or tinctures, or aromatics.

With regard to *alkaline waters*, the lecturer stated, that there were none which could be regarded strictly as alkaline. Those classed as such afford an alkaline reaction, feel soft or velvety

to the touch; and operate almost as saponaceous fluids upon the skin. The most celebrated waters of this class are those of Slanganbad and of Ems, in Nassau; both of which contain carbonates of soda with magnesia. The Kesselbrunen at Ems contains more alkaline matter than the Slanganbad water: it is taken internally, and also used as a bath. When the waters of these alkaline springs are taken for a considerable length of time, they cause feelings of lassitude and exhaustion, and produce emaciation. They are not exported.

Saline springs are very abundant in this country, as well as on the continent. Besides most of the substances enumerated as the components of acidulous waters, they contain, also, chloride of magnesium, sulphates of magnesia and potassa; and occasionally iodides and bromides; oxygen and nitrogen gases; traces of iron, manganese and silica. They are of different temperatures, and include all the thermal springs.

The most celebrated cold saline springs in this country are those of Cheltenham, Leamington-Priors, and Scarborough; those on the continent, Carlsbad, Marienbad, Seidlitz, and Pulna. The lecturer selected the last-mentioned water as a specimen of the class. The Pulna water does not rise from springs, but appears in wells dug by the peasants, in the transition-soil around Pulna. When first the water enters these wells, it has no taste; but after a few weeks, it becomes bitter, and acquires purgative properties. These properties seem to depend on magnesian salts, as was demonstrated by a copious precipitate being caused in the water by diphosphate of ammonia. The mode of separating the salts of soda, potassa, and lime was pointed out; and that of detecting bromides and iodides in saline waters.

All the saline mineral waters are purgative, unless when underdosed, in which case they act as diuretics, especially if the surface of the body be kept cool. All of them weaken the habit if they be long used, on which account they should be discontinued at intervals. This objection, however, does not apply to those which contain carbonate of iron, even in small quantity. The season for drinking saline waters is summer; for they are too much diluted in winter to prove efficacious. Those containing carbonate of iron do not bear exportation, as the carbonic acid escapes, and the iron falls down as a sesquioxide.

The thermal springs differ from the cold saline springs, as far as relates to their contents, in the greater quantity of silica which they contain. Many of them hold so small a proportion of solid matter, that any salutary power they possess depends solely on the temperature of the water. The temperature of these springs varies, in a range from 84° to 167°, the latter

being the heat of the Great Sprudel at Carlsbad, one of the hottest springs used for therapeutical purposes; but some springs, as for example those of the Geyzer and Rykum, in Iceland, are above 212°. The lecturer gave an interesting account of these springs, illustrated by a drawing of the Geyzer; and explained the theory of the intermittent eruption of their waters. When the temperature of thermal springs exceeds 108°, the water requires to be cooled down before it is employed, either as an internal remedy, or as a bath. When drunk, they stimulate the capillary system, and prove highly beneficial in glandular diseases, and in various chronic, deep-seated, inflammatory affections.

Chalybeate springs are the most abundant of all mineral waters. They are readily recognised by their inky taste, and the property of striking a bluish-black with infusion of galls, and a greenish-blue with ferro-cyanide of potassium. The iron held in solution may be either a carbonate or a sulphate. When an excess of carbonic acid is present, the water is termed an *acidulous carbonated-chalybeate;* when the carbonic acid is in small quantity, it is said to be a *saline carbonated-chalybeate;* and when the iron is in the state of a sulphate, it is a *sulphated chalybeate;* or an *aluminous chalybeate*, if the water contains *sulphate of alumina.*

The first of the forementioned chalybeates is not unfrequent in this country; but the proportion of carbonate of iron is very small. In the Tunbridge Wells water, it does not exceed three grains in the imperial gallon; and in the Shotley-bridge spring, the strongest chalybeate in this island, the proportion is one grain of the protocarbonate in each winepint of the water. In some of the continental springs, the quantity is even greater than that of Shotley-bridge. The lecturer selected the Pyrmont water as a specimen of this class. It contains ten-and-a-half grains of protocarbonate of iron, and 300 cubic inches of carbonic acid gas in the imperial gallon. The other ingredients are sulphates of soda, magnesia, and lime; carbonates of lime and magnesia; and chlorides of sodium and calcium, with a trace of resinous matter. As a specimen of the sulphated chalybeates, he chose the Sandrock water, which contains about 330 grains of the protosulphate of iron, and nearly 250 of sulphate of alumina, in the imperial gallon, in conjunction with chloride of sodium, sulphates of soda and magnesia, with a trace of sulphate of lime. It is intensely styptic; and gives a deep blue with ferrocyanide of potassium. It cannot be drunk without being diluted.

The sulphated chalybeate springs usually rise in coal formations that abound with iron pyrites, the origin of the salt of iron contained in them. They do not tinge the ground or rock

where they well out with iron-rust, and they do not precipitate the iron when they are boiled. Some of them—the strong Moffat chalybeate for example—contain upwards of 590 grains of the sesquisulphate of iron, besides more than 100 grains of sulphate of alumina, and some free sulphuric acid in the imperial gallon.

The lecturer pointed out the mode of determining the quantity of iron in mineral waters.

Chalybeate waters are the most efficient of all the mineral springs; for notwithstanding the minute quantity of carbonate of iron in some of them, they produce beneficial effects that do not follow the use of the same salt of iron prescribed in the usual form by the physician. These waters enter the circulation, change and improve the quality of the blood, impart tone and vigour to the muscular tissue, and augment the secreting function. When chalybeate waters contain much carbonic acid, a few beakers taken in rapid succession cause a transitory feeling of intoxication: they also operate as diuretics. They should be drunk in the morning, and brisk exercise taken after each glass of the water. They prove hurtful to plethoric persons and those of a rigid fibre, especially when there is any tendency to active hæmorrhages or visceral congestions, or any organic change of structure, or tendency to apoplexy. Whatever may be the condition of the habit, a course of chalybeate water should always be prefaced by some evacuation of the alimentary canal.

The class of *sulphureous waters* is nearly as extensive as that of the chalybeates. These waters are readily recognised by their odour of sulphuretted hydrogen; and their deposition of sulphur when they are long exposed to the air.

The Harrowgate Spring, the water of which was selected as a specimen of the class, rises in a bed of shale, superimposing mountain lime-stone, and covered by magnesian lime-stone. The water of the old well is limpid, colourless, and transparent: its temperature is 49°; its odour powerfully fetid; and its taste saline and nauseous. It blackens the salts of lead, and gives a chocolate-brown precipitate with ammonio-nitrate of silver. The winepint contains nearly two cubic inches of sulphuretted hydrogen gas; $1\frac{1}{10}$ cubic inch of nitrogen; 1.18 of carbonic acid gas, and nearly one cubic inch of carburetted hydrogen gas. The other ingredients are chloride of sodium, bicarbonate of soda, chloride of calcium, sulphate and carbonate of lime, and chloride of magnesium, with a trace of carbonate of magnesia. Some of the continental waters of this class contain seven cubic inches of sulphuretted hydrogen gas in the winepint.

These waters operate as powerful excitants, and their employment requires more discrimination and caution than any of the other mineral waters. They are contra-indicated in irritable

nervous temperaments; in those predisposed to headache, and affections of the brain; and those having a tendency to hæmorrhage of the lungs. When used as baths, they clear the skin of eruptions depending on a diseased action of the secreting vessels, sympathizing with a deranged condition of the digestive organs. Taken internally, they operate as purgatives, diuretics, or diaphoretics, according to the condition of the system of the patient at the time of using them; they especially augment the flow of the bile.

In conclusion, the lecturer stated his reasons for advising every mineral water to be drunk at the fountain-head; for although many of them bear exportation well, yet much beneficial influence arises from the absence of the cares and anxieties of home; and the determination to enjoy the passing hour, which always sways the frequenters of watering-places, conjoined with the early hours necessarily imposed upon invalids.

PHARMACEUTICAL MEETING,

FEBRUARY 14th, 1844.

MR. PAYNE, PRESIDENT, IN THE CHAIR.

ON MR. PATTINSON'S PROCESS FOR OBTAINING

MAGNESIA FROM MAGNESIAN LIMESTONE.

BY MR. MORSON.

Having received for examination a specimen of carbonate of magnesia, prepared by a new patent process, and thinking it would prove interesting to the Society, I requested of the patentee, Mr. Pattinson, an extensive chemical manufacturer, of Gateshead, to bring this matter before you, and having his permission so to do, will endeavour to give you some idea of the ingenious process by which, I am informed, it is obtained.

This magnesia is extracted from the magnesian limestone of Durham, a mineral containing from forty-four to forty-eight per cent. of carbonate of magnesia, combined principally with carbonate of lime, a small quantity of iron and silica, and is separated without the aid of any chemical agent not contained in itself, with the exception of heat. This at first would appear to be almost impossible, but it is, in fact, true; and one of those beautiful circular processes (if I may use this expression) which reflect

so much credit on modern manufacturing Chemistry, in which every circumstance is considered, nothing that can be employed lost, and thus cheapness and, in some instances (as the one under our present consideration), great purity of product obtained.

The limestone is first placed in close iron vessels, and calcined at a dull red heat; by which operation the contained magnesia is decomposed, and its carbonic acid driven off: the carbonate of lime united with it requiring a much higher temperature for its decomposition, remains unchanged. The calcined mass is next placed in a strong closed iron vessel, mixed with a large proportion of water; and the carbonic acid resulting from the calcination forced into it by a powerful pump, in the usual manner of preparing magnesia or the artificial mineral waters, by which process a large quantity of the magnesia alone is brought into solution, as the lime remains unacted on so long as magnesia is in excess. The saturated solution, containing fifteen grains in the fluid ounce, is now drawn off and rapidly boiled, by which the carbonic acid is set free, and the magnesia deposited in the form now presented to you; and by employing a closed vessel for this purpose, the carbonic acid liberated could be re-employed.

On a first impression, it would appear that this process, however ingenious, could not be profitably employed, but this impression, I am informed, is erroneous, and the proof is, that the product is offered at the usual price. It is, however, only possible to conduct it in such localities as contain the limestone fuel and good river water in abundance; and the neighbourhood of Gateshead, on the Tyne, is one of the places best adapted for the purpose, and where the specimen before you was prepared.

I have been informed that it has been objected to this magnesia, that it is heavier than the ordinary kind, but I cannot see any justice in this objection, as the heavy carbonate is by many preferred, and as by this process no neutral salts have to be removed by washing, there is less chance of impurity in the product.

ON SPIRITUS ÆTHERIS NITRICI.

BY MR. ALSOP.

The commercial preparation of Spiritus Ætheris Nitrici is carried forward upon a large scale, and the article, as supplied by the wholesale houses, varies greatly both in its sensible and in its chemical properties; I am therefore induced to offer a few observations resulting from experiment, which, I trust, will not be found void of interest.

The acid used in experiment No. 1, was a pale nitrous, or slightly coloured nitric, of sp. gr. 1.375, which, by Dr. Ure's table, contains about sixty-six per cent. of acid of 1.500 sp. gr.; using, therefore, 3 lbs. troy=about 48 fluid oz. of rectified spirit, the acid would require to be increased by one-half, that is, to 6 oz. troy. The acid having been carefully mixed with the spirit, I proceeded to draw off the quantity directed, which distilled with a crepitating ebullition, and upon carefully examining the product (of sp. gr. .828—not .834, as given in the Pharmacopœia), I found it to be simply rectified spirit, almost absolutely without odour of nitric ether, yet giving a slight brown by the action of liquor potassæ. A further portion was then drawn, still without ether, or nearly so; but when the spirit in the retort was reduced to a quantity about equal to that of the acid employed—under which circumstance the spirit ceases for a moment to boil, being held back by the acid, and the loss of caloric from evaporation being stayed, the temperature rises to that required for etherification, and a stream of very minute bubbles indicates the commencement of this change; it was then withdrawn from the lamp, and a very rapid and spontaneously-increasing ebullition took place, and continued as long as ether was produced, indeed rather longer, forming acetic acid, &c.

2. In another experiment, the proportions of the Pharmacopœia were employed, adding to the spirit an equal quantity of water; in which case, the portion directed to be drawn evidently contained a little ether, but not nearly so much as the after-portion. In this instance, the presence of water allowed the mixture to attain a higher temperature than when rectified spirit only was employed, thus favouring the mutual decomposition.

These experiments were made in quantities not exceeding a few ounces, and the distillation was performed by a single jet of gas. In a subsequent one, two pounds troy of spirit, of .838, were employed, mixed carefully with $2\frac{2}{3}$ ounces of nitric acid, of 1.500, and distilled by the heat of a water-bath. In this case, some ether was continuously formed throughout, until $21\frac{1}{3}$ fluid ounces were drawn off, affording a fair spiritus ætheris nitrici. The process was then continued till the remainder of the spirit had passed over, which took place without violent ebullition; and this latter portion was very much more etherial than the former.

It is evident in this, as well as in many other decompositions, that a certain temperature is requisite to be attained; which in the first experiments was prevented by the ready evaporation of the spirit, and the heating power being applied to but a very small portion of the surface of the retort. In the still more perfect application of heat by steam, the result may be more complete than by the water-bath; but unless it differs very greatly from those I

have obtained, not nearly the whole of the ether producible from the acid employed, will be present in the first product.

It is, therefore, an inquiry of importance, whether this is intended to be the case? In an experiment which follows, I have assumed it to be so; although when we take into consideration the low specific gravity given in the Pharmacopœia for spiritus ætheris nitrici, and the density of hyponitrous ether, it is additionally problematical. It does not appear to me, from such observations as I have been able to make, that any change of importance takes place in the greater part of the free spirit, except the abstraction of a little water; and when we bear in mind that nitric acid, in order to form hyponitrous ether, combines with only about its own weight of spirit, the inquiry presents itself, and may be allowed, whether any adequate advantage results from the process, to compensate for the enormous sacrifice of so expensive an article as rectified spirit, viz., one-third of the quantity employed?

3. I took three pounds troy of spirit, of sp. gr. about .830, equal to about forty-eight fluid ounces, forty ounces of which were placed in a receiver surrounded by water, and to the remaining eight ounces the acid was carefully added at intervals. That employed was nearly white, and of sp. gr. 1.378, containing, by the tables, about two-thirds of its weight of acid, of 1.500; it was therefore necessary to increase the quantity by one-half, on account of its deficiency of strength, and again by one-half to convert the whole quantity of spirit into spiritus ætheris nitrici, thus, $4 \times 1\frac{1}{2} \times 1\frac{1}{2} =$ 9 ounces of acid employed. Very little heat was disengaged, and the mixture manifested no tendency to spontaneous action; not so, however, when acid of the sp. gr. 1.500 was used, in which case a violent and almost explosive formation of ether took place without the application of heat. A *deep red* acid is also liable to spontaneous action. A retort was mounted, the beak of which was elongated by a tube dipping beneath the spirit in the receiver, and a funnel terminating in a capillary opening was placed in the tubulure. About two drachms of this mixture was put into the retort, and on applying a small flame, etherification taking place almost immediately, the flame was withdrawn; the remainder of the mixed fluid was supplied through the capillary tube almost continuously, but not so rapidly as to reduce the temperature in the retort so as to stop the action. Thus a steady ebullition and most satisfactory conversion of the alcohol into hyponitrous ether takes place, condensing as it forms, and flowingin to the spirit—the process occupying only so much time as is required to draw over the ether; and the whole may be accomplished without the further aid of extraneous heat, and may be completed in an apartment from which flame is excluded. It might be better to in-

terpose a small receiver containing a little water between the retort and the spirit, in which any free acid might be detained. The quantity produced is about equal to the weight of the spirit employed. I send a specimen, of which the sp. gr., at 60°, is about .850, but when diluted with half its bulk of rectified spirit, .840.

4. I have also prepared hyponitrous ether without heat, by a process similar to that given by Turner, viz., Rectified spirit is placed in a bottle, filling it about one-fourth: then, by means of a funnel ending in a narrow aperture and reaching to the bottom, a small stratum of water is introduced beneath it, taking care that they do not mix; and again beneath this, a quantity of fuming acid, of 1.38, equal in measure to the spirit employed; thus forming three distinct strata. The bottle is then lightly stopped, and left in a temperature not higher than 53°. The gradual change taking place in the upper part of the red acid, through the shades of blue, green, and yellow, renders it a most beautiful experiment; and after three or four days, a stratum of ether will be found forming at the top, and increasing until it reaches in measure about half that of the spirit employed. It forms a somewhat different article from that obtained by distillation, and is of sp. gr. .900.

5. In one experiment alcohol was allowed to fall by drops upon the nitric acid, in which case the product appeared almost entirely to consist of acetic ether.

Mr. Scanlan stated, that he had recently been engaged in performing experiments on this subject, with the intention of giving the results to the Society in a paper; there were several points in the paper just read, in which Mr. Alsop had anticipated him, and especially in reference to the large proportion of ether which was formed from the residuum in the retort after the completion of the Pharmacopœia process. It was evident, therefore, that the process of the Pharmacopœia was not an economical one, and he was aware that it was not generally adopted by manufacturers; in fact, the price at which sweet spirit of nitre is frequently sold in the wholesale market, would alone give rise to a suspicion that it was not made in the regular way. It must be recollected, that the making of this article is a business of itself, and that it is well known by many members of the Society, as well as by the Government, that a large quantity of illicit spirit is used for this purpose. He also adverted to the fact, that nitrous ether is obtained from the residual liquor of the process for the preparation of fulminating mercury. It had been objected to the ether thus obtained, that it contained an appreciable quantity of hydrocyanic acid. Nevertheless, it was too frequently the case that this article was diluted with illicit

spirit, and sold to some of the wholesale druggists at 1*s.* 6*d.* per pound. He had recently seen, on the premises of a manufacturer near Birmingham, an apparatus at work in which many gallons of this nitrous ether were distilled at a time, and notwithstanding the objections which had been raised against the article, he regretted to say that there still existed a considerable demand for it on account of its low price.

The President could not allow the opportunity to pass, without adverting to the recent occurrences in reference to the sale of spirit of wine, and the interview which had been granted to a deputation of the Society by the Government. It was evident that so long as Druggists continued to encourage the illicit manufacture of spirit, by purchasing nitrous ether under the circumstance alluded to by Mr. Scanlan, it was quite impossible for Government to afford them the protection they desired, and indeed it was unreasonable to expect it. The Chancellor of the Exchequer and the Chairman of the Board of Excise were aware of the existence of this disreputable practice, and had urged the circumstance as one reason for refusing to grant the request of the deputation. It was evident, therefore, that not only considerations of honesty, but also motives of interest should induce all our members to discountenance such a nefarious system, by refusing, under any circumstances, to purchase sweet spirits of nitre when offered at a price at which it cannot honestly be prepared.

Mr. Squire considered the modification in the amount of the product according to the quantity of ingredients operated upon at a time in distilling sweet spirit of nitre, to be a very important point in Mr. Alsop's paper: he thought it was very desirable to discover some method of determining the proportion of ether contained in any specimen. The only test known for determining the strength of the sweet spirit of nitre of the London Pharmacopœia being founded on the specific gravity, was fallacious, since the required density might be produced by the addition of water when the quantity of ether was deficient. He also thought the degree of heat applied to the retort might possibly affect the nature of the product, and inquired of Mr. Scanlan what means he adopted in this respect?

Mr. Scanlan stated, that when engaged in the manufacture of this article on the large scale, he had employed earthenware retorts, containing about ten gallons each, which were heated by steam jackets; but in his recent experiments, he had used a water-bath. He did not think it likely, however, that the mode of applying the heat would materially influence the result, as the external heat of the retort would only affect the rate of evaporation, and could not vary the boiling point of the contents.

Mr. Humpage confirmed Mr. Alsop's statement, that when very small quantities were operated upon, according to the directions of the Pharmacopœia, little or no ether was formed.

Specimens of BETTS's PATENT METALLIC CAPSULES, for securing the mouths of bottles, jars, &c., were exhibited to the meeting. These capsules are made of block tin, and are so constructed that, on being applied, they may be compressed and moulded to the form of the vessel, so as completely to exclude the air and supersede the use of sealing wax or resin.

On Wednesday evening, February 28th,

A LECTURE

Was delivered at the house of the Society,

ON ALKALIMETRY, ACIDIMETRY, & CHLOROMETRY.

BY ANDREW URE, M.D., F.R.S.

Honorary Member of the Pharmaceutical Society, &c. &c.

[The substance of the lecture will be found in the following paper, which had previously been prepared for publication in the journal.—ED.]

ALKALIMETRY.

TWENTY-EIGHT years have elapsed since I was led by peculiar circumstances to construct a very simple method of testing alkalis, the principle of which I soon afterwards applied to acids, bleaching powder, dye stuffs, and most other chemical substances extensively used in manufactures.* In 1814 and 1815, during the summer vacation of my Glasgow classes, I was engaged in delivering courses of lectures on Chemistry in the Belfast Academical Institution, and had many of the most eminent members of the Linen Board of that town for my pupils. Being occasionally consulted upon the qualities of the alkalis, which were used to the value of £200,000 by the linen bleachers of Ireland, I saw the importance to them of a simple alkalimetrical test, both for pur-

* Among others to nitrate of potash, nitrate of soda, and to white lead, either in powder or in paint. My nitrometer enables a person not at all versant in chemistry to ascertain in a quarter of an hour, but by two distinct processes, the quantity of pure nitrate, in either of these salts, to one part in 200. The cerussa-meter is equally simple and expeditious.

chasing and for using their barillas and potashes. The following extract from the Belfast *News Letter*, of July 9th, 1816, will show the nature of my contrivance:

"This day one of the porters of the Linen Hall, Belfast, was called into the library-room at the request of Dr. Ure, who being quite unknown to Dr. Ure, and never having seen any experiments made with acids and alkalis, he took the instrument at our desire, which being filled with coloured acid, by pouring it slowly on adulterated alkali, which we had previously prepared, he ascertained exactly the per centage of genuine alkali in the mixture. Belfast, 25th June, 1816.

"(Signed) JOHN S. FERGUSON, *Chairman.*
JAMES M'DONNEL, M.D.
JOHN M. STOUPE.
S. THOMSON, M.D."

Of these gentlemen, two were leading members of the Linen Board, and the others the two principal physicians of the town. The publication of the details of my method of alkalimetry was delayed till arrangements were made for its general introduction, under the direction of the Linen Board of Dublin, whose Professor of Chemistry, Mr. W. Higgins, as well as Dr. Barker, Professor of Chemistry in Trinity College, granted certificates of the "accuracy and the national importance" of the instrument. The alkaline matter then imported into Ireland was often largely contaminated with common salt, even to the extent of 80 or 90 per cent. During the procrastination of the Board, I lent my Treatise on Alkalimetry to Dr. Henry, of Manchester, who inadvertently published an account of it, though with reference to me, in the next edition of his *Elements of Chemistry*. Having, in the long interval since, contrived many modifications of the instrument, and having extended its principle to testing other articles, I am induced to offer it now to the world, in consequence of the recent appearance of a publication upon the same subject, by two very ingenious Chemists of Liebig's school, Drs. R. Fresenius and H. Will. Of their system of alkalimetry, &c. a copious abstract appeared in the *Annalen der Chemie und Pharmacie*, for July last; and about the same time a pamphlet was published by Winter, at Heidelberg, under the title *Neue Verfahrungsweisen zur Bestimmung des Werthes der Pottasche und Soda, der Saüren, und des Braunstein;* or "New Processes for determining the Value of Potash and Soda, of Acids, and Black Oxide of Manganese." However accurate these processes may be, and however apt for a German or French student of Chemistry, they are, in my apprehension, not at all fitted for the familiar use of manufacturers and dealers in any country, and certainly not for those of the United Kingdom.

Descroizilles was the first person who contrived an instrument,

called an Alkalimeter, to ascertain the alkaline strength of potash and soda, without much calculation. His method was described in the *Annales de Chimie* for 1806, tom lx., and a translation of it appeared in our *Philosophical Magazine*, vol. xxviii., for July and August of the following year. His apparatus consisted of a glass-tube, eight or nine inches long, and seven or eight lines in diameter, closed at one end, but terminated at the other in a kind of small funnel (with a beak or spout), connected to the tube by a narrow neck, having a calibre of two lines and a half. Upon the shoulder, under the throat, there was a hole for admitting air to the long tube in the act of being emptied, by sloping its mouth downwards. This cylindrical vessel was to contain thirty-eight grammes of water, which space was divided into seventy-six equal parts, which it was extremely important to proportion accurately. The liquor was prepared by taking concentrated sulphuric acid, at 66° Baumé (1.845 spec. grav.), and diluting it with nine times its weight of water. The instrument being poised in a balance, he introduced into it very exactly two grammes of the above test acid, and when the instrument stood upright, he scratched a line at the level of the liquor, and thus proceeded by addition of successive grammes to graduate the whole, till thirty-six were added, after which he subdivided these spaces by lines into seventy-two demi-gramme volumes. He then proceeds to describe eight different subsidiary articles required for his operations:

"*Alkalimetrical trials of potash.*—Weigh exactly one decigramme of potash, put it into a glass, and pour upon it about four-fifths of a decilitre of water; facilitate the solution of the potash by stirring it with a small chip of wood, three or four times in an hour and a half, a minute at each time. When the solution is effected, pour it into the small tin measure, No. 4, which is to be then filled up with water; pour it back again into the glass, in which you must still pour a measure full of pure water; stir this new mixture also three or four times within half an hour, in order to facilitate the precipitation of a slight sediment which soon falls down. This sediment being completely formed, slope the glass with caution, in order to fill with clear liquor the small measure; then empty this last into another large glass; after this, place round the edges of a plate drops of syrup of violets; pour also into the alkalimeter, test-liquor until the line marks 0; take it afterwards with the left hand, inclining it upon the glass which contains the moiety of the clean alkaline solution: the acid liquor will fall into it by hasty drops, or in a very small thread, which you may moderate at pleasure, by retarding the entrance of the air at the lateral hole or vent, upon which must be placed the end of the finger; at the same time, with a small

stick or match, assist the mixture and facilitate the development of the carbonic acid which is manifested by effervescence. When you have emptied the alkalimeter to about the line 40, try if the saturation approaches, by drawing your small stick from the mixture, and resting it upon the drops of syrup of violets, which should become green, if the potash is not of a very inferior quality. If, on the contrary, the violet colour is not altered, or what would be worse, if it be changed into red, there would be, in the first case, an indication of saturation, and in the second a proof of super-saturation. But this is not the case with good potashes: at that line, the liquor tried can alter the syrup of violets into green only; or cause to return to the violet, and even to the green, the drops which had been changed into red at the time of a former trial; we must, therefore, in general add more acid, which occasions a new effervescence. This addition must always be made with caution, and we must touch every time a drop of syrup of violets in order to stop. When at last the latter assumes a red hue, then, after having restored the alkalimeter to a perpendicular position, in order to see at what line the testing-liquor stops, you must reckon one degree less, in order to compensate the excess of saturation. The mean term of potashes is 56; this implies that they require for their saturation *fifty-five hundredths* of their weight of sulphuric acid."

For the analysis of commercial sodas of all kinds, M. Descroizilles prescribes using ten and a half deci-grammes of this alkali, instead of the ten deci-grammes for potashes, and proceeds as above detailed. In his table of results annexed, we find American potashes called 60° to 63°.

American pearl ashes	50° to 55°
Dantzic potash	45 to 55
Alicant soda	20 to 33

It is obvious, from these statements, that the alkalimeter so made and graduated denoted comparative, but not absolute, quantities of alkalies present in the commercial samples. The rest of his very long memoir is occupied with what he calls the graduation of potashes and sodas, the economy of their graduation, the proportions of carbonic acid in them, the processes of caustification, the presence of potash in all lime which is burnt by a wood fire, origin of neutral soda, and probable origin of natrum; without any more explicit instructions. The instrument, as left in this vague state, never was employed, nor could it come into use, among English manufacturers and dealers.

The next alkalimeter, of which an account has been published, was my own. In constructing this instrument, I availed myself of the lights recently shed on chemical proportions by Dr. Dalton's atomic theory, and I thus made it to represent, not relative,

but absolute measures of the amount of real alkali existing in any commercial sample. The test-liquor used at that time was sulphuric acid, which is most readily and accurately diluted to the requisite degree by means of a glass bead, very carefully made, of the specific gravity that the standard acid should have. In order to make the test-liquor, therefore, nothing more is requisite that to put the bead into distilled water, and to add to it somewhat dilute but pure sulphuric acid, slowly and with agitation, till the bead rises from the bottom, and floats in the middle of the liquor at the temperature of 60° Fahr. The delicacy of this means of adjustment is so great, that a single degree of increase of heat will cause the bead to sink to the bottom—a precision which no hydrometer can rival. The test-tube, about 14 inches long, contains generally 1000 grains of water, and is graduated into 100 equal parts by means of equal measures of mercury. The test-liquor is faintly tinged with red-cabbage or litmus; so that the change of colour, as it approaches to the saturating pitch, on adding it to 100 grains of the commercial alkali, becomes a sure guide in conducting the experiment to a successful issue. One hundred measures of this test-liquor neutralize exactly 100 grains of absolute soda (oxide of sodium), and of course very nearly 150 of potash. A bead may also be adjusted for test-liquors, of which 1000 grain measures neutralize 100 of potash, and therefore $66\frac{2}{3}$ of soda, as well as other proportions, for special purposes of greater minuteness of research. One may be so graduated as to indicate clearly a difference of $\frac{1}{100}$ of a grain of ammonia. In making such nice experiments, it is of course requisite to free the alkaline matter beforehand from sulphurets, sulphites, and hyposulphites, by igniting it in contact with chlorate of potash, as long since recommended by Guy Lussac. With such means in careful hands, all the problems of alkalimetry may be accurately solved by an ordinary operator.

On the same principle, my *Acidimeter* is constructed; pure water of ammonia is made of such a standard strength by an adjusted glass bead, as that 1000 grain measures of it neutralize exactly a quantity of any one real acid, denoted by its atomic weight, upon either the hydrogen or oxygen scale or radix; as for example, 40 grains of sulphuric acid. Hence it becomes a universal acidimiter; after the neutralization of 10 or 100 grains of any acid, as denoted by the well defined colour in the litmus-tinted ammonia, the test-tube measures of ammonia expended being multiplied by the atomic weight of the acid, the product denotes the quantity of it present in 10 or 100 grains. The proportion of any one free acid in any substance may thus be determined with precision, or to one-fiftieth of a grain, in the course of five minutes. Like methods are applied to Chlorometry,

and other analytical purposes, with equal facility; adapting the test-liquor to the particular object in view. Instead of using beads for preparing the alkalimetric and acidimetric test-liquors, specific gravity bottles or hydrometers, may of course be employed; but they furnish incomparably more tedious, and less delicate means of adjustment. To adapt the above methods to the French weights and measures, now used generally also by the German chemists, we need only substitute 100 *deci-grammes* for 100 grains, and proceed in the graduation, &c. as already described.

The possession of two reciprocal test-liquids affords ready and rigid means of verification. For microscopic analyses of alkaline and acid matter, a graduated tube of small bore, mounted in a frame with a valve apparatus at top, so as to let fall drops of any size, and at any interval, is desirable; and such I have employed for many years. Of this kind is my ammonia-meter, used in the ultimate analysis of guanos and other azotized products, in conjunction with a modified apparatus on the principle of that of Varrentrapp and Will. It may be remarked, that when the crude alkali contains some hyposulphite, it should not be calcined with chlorate of potash, because one atom of hyposulphurous acid is thereby converted into two atoms of sulphuric, which of course saturate double the quantity of alkali, previously in combination with the hyposulphurous acid. In such cases it is preferable to change the condition of the sulphurets, sulphites, and hyposulphites, by adding a little neutral chromate of potash to the alkaline solution, whence result, sulphate of chromium, water, and sulphur, three bodies, which will not affect the accuracy of the above alkalimetrical process.

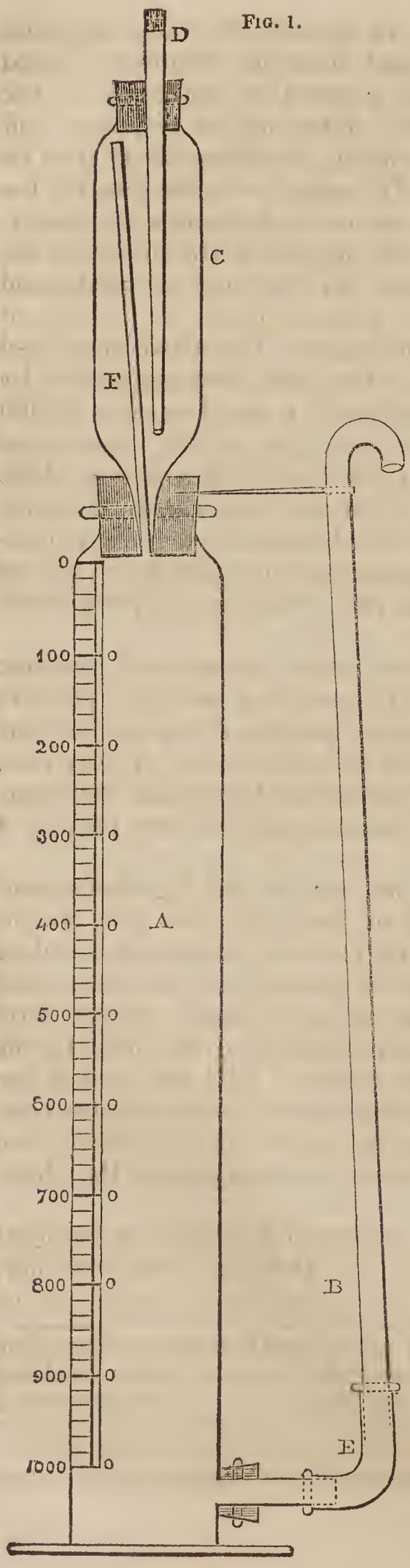
In the *Annals of Philosophy* for October, 1817, I described a new instrument for analyzing the earthy and alkaline carbonates, and for determining the quantity of base present in them from the volume of carbonic acid, disengaged by their solution in acids upon the data of the atomic theory. This method was applied to the analysis of the carbonates of ammonia, soda, potash, lime, magnesian limestone (dolomite), &c.

"The indications of the above analytical instrument are so minute as to enable us, by the help of the old and well known theorem for computing the proportions of two metals from the specific gravity of an alloy, to deduce the proportions of the bases from the volume of gas disengaged by a given weight of a mixed carbonate."*

That small instrument consisted of a bent glass tube, open at one end, and terminated at the other with an egg-shaped bulb from two to three inches in diameter, and it required for operating with it, about five pounds of quicksilver. The following glass

* *Dictionary of Chemistry*, 1821.

Fig. 1.



apparatus (fig. 1.) will be found more generally convenient, and equally exact. *A* is a cylinder $2\frac{1}{4}$ inches in diameter, and 14 inches long. It contains 10,000 grains of water in the graduated portion; *O*, or zero being at the top. It has a tubulure in the side close to the bottom, through the cork of which a short tube passes tight, and is connected to a collar of caouchouc, *E*, which serves for a joint to the upright tube, *B*, resting near its open upper end in a hooked wire. Through the cork in the *mouth* of the cylinder, the taper tail of the flask *C* passes air-tight. The small tube *F*, open at both ends, is cemented at bottom into the tail of *C*, and rises to the shoulder of the flask. The cork of *C* is perforated, and receives air-tight the taper tube *D*, which can also be closed with a cork.

In operating with this apparatus, proceed as follows:—

Fill the cylinder with water, and cover its surface with half an inch of oil. Insert the tail of the flask. Put into the flask *C*, 58.6 grains of carbonate of potash, or 45.2 of carbonate of soda, according as common pearl-ash or soda-ash is to be tested, along with as much water as will cover fully the lower end of *D*, and then introduce this tube. Have a bottle containing about 40 parts of oil of vitriol, previously mixed with 60 of water, and cooled. Take of this, in a pouring or dropping glass, 100 water grain measures, and drop this quantity gradually through the tube *D*. The carbonic acid gas forthwith disengaged, will depress the

water in *A*, cause an overflow of it from the tube *B*, which being held in the left hand, must have its swanbeak placed over a basin, and progressively lowered to the level of the descending water in the cylinder. When all the sulphuric acid has been introduced by the right hand, the orifice of *D* is to be corked, and the tube *B* continually lowered with the left, till the effervescence being finished, the water in *A* remains stationary. The number on the centigrade scale, opposite to the surface of the oil, deducting 100 grain measures for the bulk of dilute acid added, denotes the per centage of pure carbonate of potash, or of soda, in the sample under examination. The above prescribed weights of these two carbonates, when pure, disengage each by the action of sulphuric acid (used here in small excess) 10,000 water grain measures of carbonic acid gas, or 100 measures of the scale on *A*. The cylinder which I employ, contains about 1,2000 water grain measures, so that the bottom of the centigrade scale is fully two inches above the level of the lower tubulure. This capacity and the graduation into 120 parts, will be found convenient in certain cases, particularly in analyzing bicarbonates of potash and soda.*

We may estimate 10,000 water grain measures of carbonic acid at 60° Fahr., to weigh 18.4 grains, and we thus perceive what a magnified scale we should possess, if we applied the *vernier* contrivance here, as we do to barometers. At any rate, he must be an awkward operator who cannot determine the value of an alkaline carbonate, by the above means, to one part in a thousand.

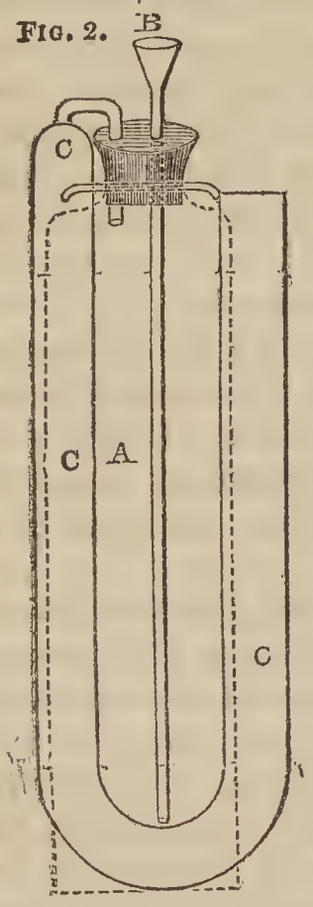
In operating upon limestones, marles, &c., 42.1 grains should be taken as the standard weight of assay, because that weight of pure carbonate of lime should give out on solution in dilute muriatic acid, 10,000 water grain measures of carbonic acid gas. Since 100 water grain measures of liquid hydrochloric acid, specific gravity 1.14 will supersaturature the lime in the above weight of carbonates, that quantity may be used in the experiment. The preceding instrument will be found more convenient in experimenting, as also the system of indication, than one on similar principles constructed by the ingenious Dr. Mohr, of Coblentz.

In examining bicarbonates of potash and of soda, the weights to be used in the above apparatus, are 42 grains of the former, and $35\frac{1}{4}$ grains of the latter, each of which quantities, if the

* For the greatest precision hot acid may be used in the above experiment, by taking in a graduated test-tube seventy-five grains of water, and filling it up to the line 100 with concentrated sulphuric acid. This mixture being poured in successive portions into the flask *C* (represented much too large in proportion to the cylinder *A*), will ensure the expulsion of all the carbonic acid from *C*, which may be afterwards cooled by wrapping round it a towel dipped in cold water.

salts be perfect, will disengage 10,000 water grain measures of carbonic acid gas, by the action of sulphuric acid. There will be no harm in taking the formerly prescribed measure of the sulphuric acid, though considerably less would answer the purpose. The centigrade measures of gas obtained in *A*, will indicate the carbonated state of the two alkalies respectively. Their alkaline force may be most readily ascertained by my old alkalimeter, with coloured test acid. Since the bicarbonates usually sold in our shops, especially that of soda, are far from being exact atomic compounds, they should be always examined, both for their base and acid, which may also be well done in the following way, where the quantity of carbonic acid gas is determined by weight instead of by volume.

Fig. 2.

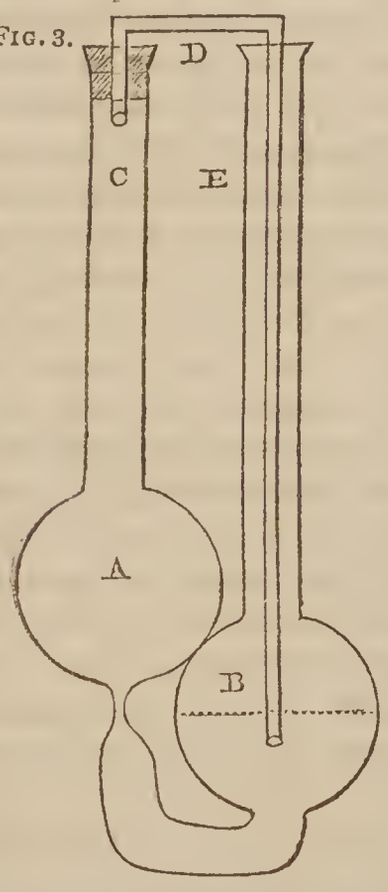


For this purpose, a small compact apparatus of the annexed form, fig. 2, will be found convenient; it is to be used in conjunction with my alkalimeter. *A* in the dotted line is the phial for receiving the carbonate to be tested; *B* the funnel into which the test acid is to be poured; *C C*, an inverted syphon filled with pieces of chloride of calcium for absorbing the aqueous vapours exhaled by the carbonic acid. The loss of weight in the phial above that in the tube of test acid, shows the quantity of acid gas, and the indication of the alkalimeter tube, that of alkaline base, from which data the proportion of neutral carbonate and bicarbonate may be immediately deduced. Thus, 100 grains of bicarbonate of soda should give out $51\frac{3}{4}$ grains of carbonic acid, and saturate 37.6 centigrade-measures of the test acid, equivalent to 37.6 grains of real soda. But if neutral carbonate of soda be present, less gas will be given out, and more or less alkali may be indicated, according to the degree of dryness of the neutral soda. The amount of water in the bicarbonate may be determined by igniting 20 grains in a test tube, connected with the chlorcalcium inverted syphon; $10\frac{1}{3}$ grains of carbonic acid gas should be expelled, and $2\frac{1}{8}$ of water, making a total loss of $12\frac{1}{24}$ grains, of which $2\frac{1}{8}$ will be found as water absorbed by the chlorcalcium. But since a very moderate heat suffices to expel the second atom of carbonic acid from the bicarbonate of soda, the readiest mode of estimating its quality is to heat, over a spirit lamp, in a small flask or retort, connected air-tight by a tube with the mouth of the cylinder *A*, fig. 1, $70\frac{3}{4}$ grains of the supposed bicarbonate. Of

the perfect salt this quantity should give out pretty exactly 10,000 grain measures of gas; and whatever aliquot part of this volume is evolved will indicate, without calculation, the relative value of the substance as a bisalt. Thus if 8500 grain measures of gas are obtained, 85 parts of bicarbonate of soda are present in 100. The crystalline form of bicarbonate of potash is a tolerably good criterion of its quality.

The quantity of caustic alkali mixed with carbonate may be readily determined, with sufficient accuracy, by the expert use of my alkalimeter; because, till the caustic portion be nearly neutralized, little or no carbonic gas is expelled. When the effervesence at length begins, the test measures already expended denote the per-centage of caustic alkali. It is not right to disregard the alkali which is present in the state of sulphuret, because as such it is effective in many processes of the chemical arts; in the manufacture of yellow soap, crown glass, in the bleaching of linen and cotton goods, &c. The alkalimeter, directly applied, will show the alkali present in this form, when compared with that indicated after ignition of the crude alkali with chlorate of potash, or after its treatment with yellow chromate of potash.*

Fig. 3.



A few years ago, I had the following apparatus made for the ready analysis of carbonates, by ascertaining the loss of weight they suffered from the disengagement of their carbonic acid gas, during their solution in an acid. *A B*, are two globes, of about two inches in diameter each; *A* has its inferior neck strangled into a bore nearly capillary; *B* stands lower, with its centre line on a level with the narrow neck of *B*. The tubes of these globes are about one-half inch in diameter. *C* is shut at top with a perforated cork, through which enters, air-tight, a small glass tube, which is bent across to the mouth of the tube *E*, and then passes down into it a little below the centre line of the globe *B*. This globe is rather more than half filled with sulphuric acid, when the instrument is employed

* If the alkaline carbonate contain sulphuret, sulphite, or hyposulphite, a teaspoonful of yellow chromate of potash may be added to it, wherefrom result sulphate of chromium, water, and sulphur, which remain in the apparatus without affecting its weight. The mutual action of neutral chromate of potash, and of sulphuret of potash, &c., has been discussed in an ingenious paper published by Döpping, in the *Annalen der Chemie* for May, 1843, page 172.

in the analysis of the carbonates. The standard weight of carbonate of soda = $24\frac{1}{8}$ grains, or of carbonate of potash = $31\frac{1}{3}$ grains, is then put into *A*, having previously laid a minute globe of glass over the lower orifice; the cork, with its small tube, is now firmly adjusted; and the apparatus is weighed in its upright position, either by suspension with a hook to the end of the beam, or by resting it on the scale in a light socket of any kind. It is next laid hold of, and inclined so as to cause a little of the acid in *B* to pass over into *A*. Effervescence ensues with greater or less vehemence, according to the nature of the carbonate and quantity of the acid introduced. Should it be too violent, and threaten an overflow by intumescence, it can be instantly abated to any degree by the slightest slope of the instrument. Now, this power of control forms the peculiar feature and advantage of this contrivance; whereas in all other forms of such apparatus that I know, whether by sucking over or pouring in, if a little too much acid comes upon the carbonate, the experiment is effectually marred. The gas disengaged in *A* must necessarily traverse the sulphuric acid in *B*, and be stripped of its moisture before escaping into the air. Having supersaturated the alkaline base, and cooled the apparatus, we weigh it again, and the loss of weight in grains and tenths denotes the per centage of soda or potash, provided their neutral carbonates had been the subjects of experiment. For limestone, on the same plan of computation, $22\frac{3}{4}$ grains may be taken. It deserves to be noted, that the present instrument has only one junction, and needs no chloride of calcium, a substance so apt by its swelling to burst the glass tubes that contain it.*

ACIDIMETRY.

I HAVE already stated, that water of ammonia of standard strength, faintly tinted with litmus, affords a most exact and convenient acidimeter, when poured or let fall from a graduated dropping-tube. Bicarbonate of potash also, when dissolved in water, so that 1000 grain-measures contain one atom of the salt counted in grains, is a good test-liquor for the same purpose; for if the centigrade-measures expended in effecting neutralization, are multiplied by the atomic weight of the given acid, the product is the quantity in grains of acid present.

Acidimetry may be likewise exactly performed by measuring

* 1000 water-grain measures of sulphuric acid of specific gravity 1.032, or 32 above water, neutralize 32 grains of soda and, consequently, one atom of each of the other bases, counted in grains on the hydrogen scale.

Having in the course of many years subjected my tables of sulphuric, nitric, and muriatic acids, as well as of ammonia, to strict cross-examination, I have found them trustworthy for all alkalimetrical and acidimetrical purposes.

in the cylindric gas-meter (fig. 1), the volumes of carbonic acid gas disengaged from pure bicarbonate of potash or soda, by a given weight of any acid, taking care to use a small excess of the salt. Thus, for example, 16.8 grains of dry and 20⅔ of hydrated sulphuric acid disengage 10,000 water grain measures of gas from bicarbonate of potash. Therefore, if 20⅔ grains of a given sulphuric acid be poured into the flask of fig. 1, upon about 50 grains of the bicarbonate, powdered and covered with a little water, it will cause the evolution of a volume of gas proportioned to its strength. If the acid be pure oil of vitriol, that weight of it will disengage 10,000 grain measures of gas; but if it be weaker, so much less gas—the centigrade-measures of which will denote the per centage value of the acid. If the question be put, how much dry acid is present per cent. in a given sulphuric acid, than 16.8 grains of the acid under trial must be used; and the resulting volume of carbonic acid gas read on the scale will denote the per centage of dry acid.*

For nitric acid, we should take 22.6 grains; for hydrochloric or muriatic acid, 15.34; for acetic acid, 21.6; for citric acid, 24.6; for tartaric acid, 28 grains: then in each case we shall obtain a volume of carbonic acid gas proportioned to the strength and purity of these acids respectively. The nitric, hydrochloric, and acetic acids are referred to in their anhydrous state; the tartaric and citric in their crystalline. If the latter two acids be pure, a solution of 24.6 grains of the first and of 28 of the last, will disengage from 50 grains of bicarbonate of potash, 10,000 grain measures of carbonic acid gas.†

Acidimetrical operations may likewise be performed by determining the *weight* of carbonic acid gas expelled from the bicarbonate of potash or soda, by a given quantity of any acid, in the apparatus either fig. 2 or fig. 3. Here the weights to be taken are as follows: in reference to

	Grains.
Dry Sulphuric acid.....	9.127
" Nitric	12.33
" Hydrochloric	8.29
" Acetic	11.67
Crystallized Tartaric	13.31
" Citric	15.13

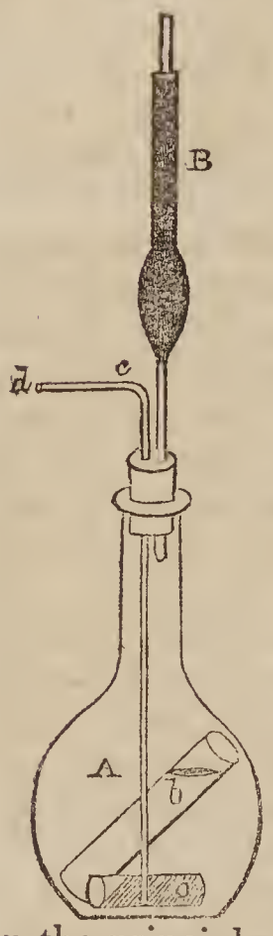
Each of these quantities of real acid, with 25 or 26 grains of bicarbonate of potash, will give off 10 grains of carbonic acid gas; and hence whatever weight the apparatus loses, being reckoned in grains and tenths of a grain denotes the per centage of acid in the sample under trial, without the necessity of any arithmetical reduction. Persons accustomed to the French metrical system

* The bicarbonate must be free from carbonate, a point easily secured by washing its powder with cold water, and drying it in the air.

† The expulsion of the gas may be completed by surrounding the flask with a towel dipped in hot water.

may use deci-grammes instead of grains, and they will arrive at the same per centage results.

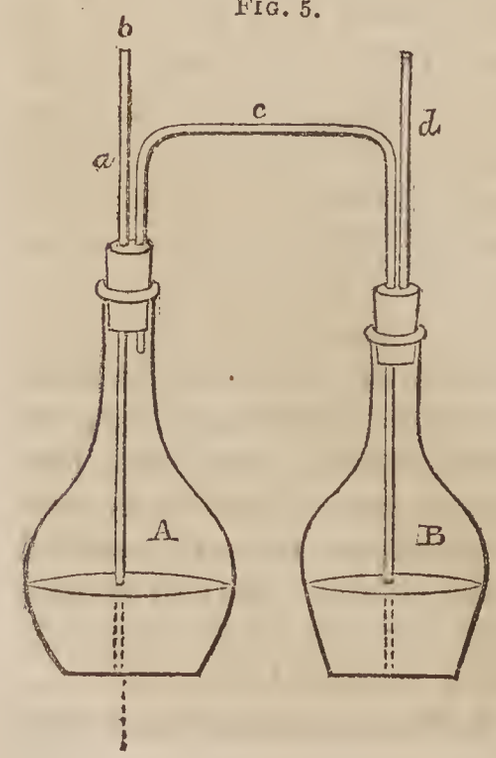
Fig. 4.



The preceding experiments, in reference to the weight of carbonic acid gas expelled for the purpose of either alkalimetry or acidimetry, may also be made by means of the ordinary apparatus represented in fig. 4. *A* is a small matrass which contains the acid or carbonated alkali at its bottom; and conversely the alkali or acid, for their mutual decomposition in the small test-tube, shown first at *b* nearly upright and filled, but afterwards at *a*, horizontal and emptied. *B* is a bulbous tube filled with fragments of chlorcalcium for absorbing the aqueous vapour that rises with the carbonic acid gas, and *d c* is a small bent tube which dips into the liquid in the matrass. The weighings, &c. may be conducted as already detailed; and when the effervescence is completed, the residuary gas is sucked up through *B*, while the atmospheric air enters to replace it at the orifice *d* of the bent tube.

The NEW methods which pervade the whole treatise of Drs. Fresenius and Will are all based on the principle of estimating alkalinity, acidity, and the oxygen in manganese (or chlorometry) by the weight of carbonic acid gas evolved. As in taking these measures the gas must be discharged without carrying water off with it, an elegant and ingenious little piece of apparatus has been invented by the authors for effecting that purpose, and it will do it well. *A* and *B* (fig. 5) are two flasks (wide-mouthed medicine bottles may be employed). *A* must have a capacity of from two ounces to two ounces and a half of water; it is advisable that *B* should be somewhat smaller, say of a capacity of about one to one and a half ounces. Both flasks are closed by means of doubly perforated corks. These perforations serve for the reception of the tubes *a*, *c*, and *d*. *c* is a tube bent twice at right angles, which enters at its one end just into the flask *A*, but descends at its other end, near to the bottom

Fig. 5.



of *B*. These tubes are open at both ends when operating; except the top end *b* of the tube *a*, which is closed by means of a pellet of wax. The substance to be examined is weighed and put into the flask *A*, into which water is then poured to the extent of one-third of its capacity. *B* is filled with common English sulphuric acid to about half its capacity. Both flasks are then corked (by which they become united by the rectangular tube), and the apparatus is weighed.

The air of the whole apparatus is next rarified by applying suction to the tube *d*: the consequence is, that the sulphuric acid contained in *B* ascends into the tube *c*, and thus a portion of it flows over into *B*. Immediately upon its coming into contact with the carbonate contained in *A*, carbonic acid gas is disengaged, and in its escape must necessarily traverse the oil of vitriol in *B*, and therein deposit all its aqueous vapour before issuing from *d*. The sulphuric acid in passing over into *A* heats the mixture at the same time, and thus promotes the expulsion of the gas. Whenever this ceases to flow, a little more sulphuric acid must be sent over into *A* by suction from *d* (or rather from a recurved tube attached, *pro tempore*, to it); an artifice which may be repeated till no more gas can be expelled, even when the contents of *A* are heated, as they must be at the end by the excess of oil of vitriol.

From the aperture *b* of the tube *a*, which has been all the time closed, the bit of wax is now to be removed, and to the tube connected with *d*, suction is to be applied, till all the carbonic acid lodged in the apparatus be replaced by atmospheric air. The whole is to be then cooled, wiped, and weighed; the loss of weight indicates exactly the quantity of carbonic acid which existed in the carbonate submitted to experiment. The process is no less neat than it is simple, and does honour to the ingenuity of its inventors. Their mode of deducing the per centage of alkali from the quantity of carbonic acid discharged in the operation is also quite exact, and suitable for continental Chemists familiar with gramme weights and calculations, but certainly not for persons conversant only with ounces, drachms, and scruples, or even with grain subdivisions. The whole book, however excellent, needs for the British public transposition, before it can serve in this country the purpose intended by its scientific authors. Thus, in section 4, where several results of their analyses are given, the statements have a somewhat mysterious aspect. Should any one ask why the oracular number of 4.83 grammes of carbonate of soda is used as their standard weight for analysis, he can obtain no response in the book, either in a note or any where else. A German or French student, familiar with chemical computation, will probably be able to discover that 4.83 grammes of pure car-

bonate of soda contain, by Berzelius's tables of atomic weights, two grammes of carbonic acid; for 53.47 (one atom of carbonate) : 22.15 (one of carbonic acid) :: 4.83 : 2.00. Such is the simple solution of this apparent enigma, and of some other similar puzzles in the book. Indeed, unless the reader is aware of that proportion, he cannot see the grounds of the accordance in the results between experiment and theory, or why the numbers 2.010, 1.993, and 2.020 are presented as specimens of great precision. This accordance gives satisfaction when it is known that these numbers, in experiments 1, 2, and 3, oscillate on one side or other so near to the theoretical number 2.00. But four grammes and eighty-three centi-grammes, as also one gramme and 995 milli-grammes are awkward weights for an ordinary English Chemist or Apothecary, which would require a month or two's residence in the laboratories of Giessen and Paris to manipulate with readiness.

Again, in testing carbonate of potash, our authors take 6.29 grammes as their unity of weight, undoubtedly, because, if pure, it should discharge by saturation with the sulphuric acid, two grammes of carbonic acid. Here, however, they have not stuck so rigidly as the school of Giessen usually does to Berzelius's atomic numbers; for his atom of carbonate of potash is 69.42; whence, 22.15 : 69.42 : : 2.00 : 6.68, hydrogen=1.00; or 276.44 : 866.33 : : 2.00 : 6.268 oxygen=100.

Admitting the value of the new method in testing neutral carbonates, it cannot be directly applied to the mixed carbonate and bicarbonate of soda, so commonly sold in this country for bicarbonate; nor is it applicable to the case of a mixture of caustic and carbonated alkali, without the tedious process of previous treatment with carbonate of ammonia and heat.

The new German method of *acidimetry* consists in determining how much carbonic acid gas is disengaged from a standard bicarbonate of soda, by a given weight of any acid. The twin-flask apparatus (fig. 5) is used. The weighed portion of acid is put into *A*, and a sufficient quantity of the soda into a test tube, which is suspended upright with a silk thread fastened by the pressure of the cork to the mouth of the flask. On letting the thread loose, the test tube falls, and the cork being instantly replaced, the whole gas evolved is forced to pass through the sulphuric acid in *B*, and there to deposit its moisture. The experiment is conducted in other respects as already described for alkalimetry.

The following extract from Drs. Fresenius and Will's *New Methods of Alkalimetry*, &c. will show the Giessen plan of calculating results:

"The amount of anhydrous acid contained in the hydrated acid under examination is determined from the amount of carbonic acid escaped, as follows:

"Two measures of carbonic acid bear the same proportion to one measure of the anhydrous acid in question, as the amount of carbonic acid expelled does to the amount sought of anhydrous acid. Thus, let us suppose, for instance, we had examined dilute sulphuric acid, and obtained 1.5 grammes of carbonic acid, the arrangement would be :

$$550\ (2 \times 275) : 501 = 1.5 : x$$
$$x = 1.36.$$

The amount of sulphuric acid operated upon consequently would contain 1.36 grammes of anhydrous acid. Let us suppose the weight of this amount to have been 15 grammes, the sulphuric acid under examination would contain a per centage amount of 9.06 ; for

$$15 : 1.36 = 100 : x$$
$$x = 9.06."*$$

"Section XXIX. *Stating the Quantities of the various Acids to be used in their Examination.* — To enable our readers at once, without the trouble of calculation, to determine from the weight of carbonic acid expelled, the exact amount of anhydrous acid contained in those acids which are of most frequent occurrence, we have subjoined lists of certain quantities to be taken of each acid, for experiment, so that the number of centi-grammes of carbonic acid expelled will directly indicate the per centage amount of anhydrous acid in the acid under examination.

"Multiples of those weights may of course be substituted for the numbers given, according to the degree of dilution of the acid under examination. In such cases the number of centi-grammes of the carbonic acid expelled must be divided by the same number which has served as the multiplier.

"These numbers are obtained by dividing the atomic weight of the acid by 550 (2 × 275, one eq. of carbon †), as follows :

"Two eq. of carbonic acid, corresponding to one eq. of the acid to be examined, how much should be taken of the latter to expel 1.00 grammes of carbonic acid ?

"The arrangement for sulphuric acid, for instance, is as follows :

$$550 : 501 = 1.00 : x$$
$$x = 0.91 \text{ (or, more correctly, } 0.911).$$

"When examining acids, it is most advisable to use that multiple of the unity (according to the degree of concentration) which will expel from one to two grammes of carbonic acid.

"I. SULPHURIC ACID.

"Unity 0.91 grammes (or, more correctly, 0.911 grammes).

"Multiples :

2 × 0.911	=	1.822	grammes
3 × 0.911	=	2.733	"
4 × 0.911	=	3.644	"
5 × 0.911	=	4.555	"
6 × 0.911	=	5.466	"
7 × 0.911	=	6.377	"
8 × 0.911	=	7.288	"
9 × 0.911	=	8.199	"
10 × 0.911	=	9.110	"
15 × 0.911	=	13.665	"
20 × 0.911	=	18.220	"
30 × 0.911	=	27.330	" &c.

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* *New Methods of Alkalimetry, &c.* pp. 93, 94.

† A typographical error in Mr. Bullock's edition ; it should be *carbonic acid.*

"Thus, knowing that 0.91 of anhydrous sulphuric acid will expel 1.00 of carbonic acid, it will be easy to determine what multiple ought to be used, according to the degree of concentration of the acid to be examined."*

CHLOROMETRY,

AND THE TESTING OF BLACK OXIDE OF MANGANESE FOR ITS AVAILABLE OXYGEN.

The value of manganese may be estimated very exactly by measuring the quantity of chlorine which a given weight of it produces with hydrochloric acid; the chlorine being at the same time estimated by the quantity of solution of green sulphate of iron, which it will peroxidize. A process of this kind was long ago practised with chloride of lime (bleaching powder or liquor) by Dr. Dalton; and it has been since improved by Mr. Walter Crum. As the conversion of two atoms of green sulphate of iron into red sulphate requires only one atom of oxygen, this change may be effected by the reaction of one atom of chlorine in liberating one atom of oxygen, while this appropriates one of hydrogen from the hydrochloric acid.

The weight of 2 atoms of green sulphate of iron is 278= (139 × 2), consisting of 2 atoms of protoxide = 72; + 2 of sulphuric acid = 80; + 14 of water = 126; in all = 278; and this weight is equivalent to 36 of chlorine, to 8 of oxygen, and to 44 of peroxide of manganese.† Therefore, if we take a solution of copperas, containing 278 grains in 1000 water-grain measures, that volume of liquid will represent, by the conversion of its protoxide into peroxide, exactly one atom, either of peroxide of manganese = 44 grains, or 1 atom of chlorine = 36. Hence the following plan of research:

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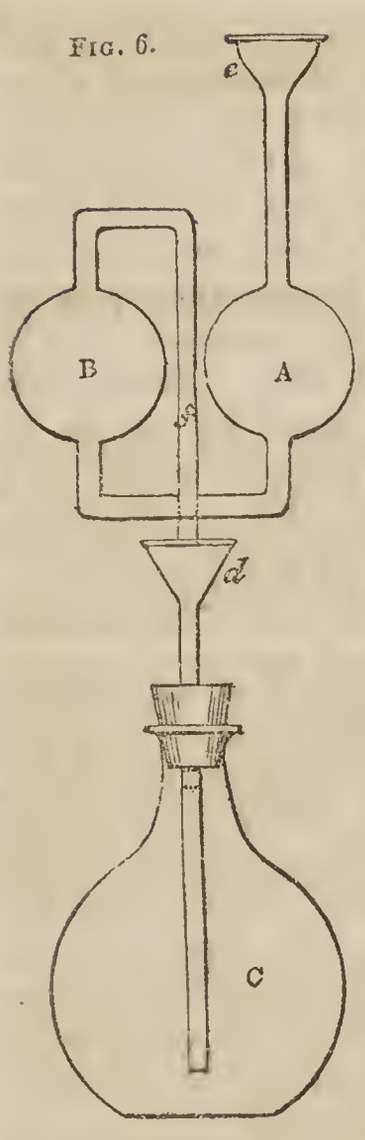
* *New Methods of Alkalimetry, &c.* pp. 103—105.

† Berzelius, in the 4th edition of his *Lehrbuch*, rates the atom of the green sulphate of iron (ferrous sulphate) at 129.43, hydrogen = 1, and considers it, after Mitscherlich, to contain only 6 atoms of water. I have ascertained, by the most careful experiments, that it contains 7 atoms of water; and that 139 grains of it, or 138.44 (Berzelius) are equivalent to 1 atom of chlorbarium, and that they yield very nearly 40 grains of peroxide of iron.

This remarkable error has probably arisen from an attempt to measure the proportion of water in the salt from its loss of weight by desiccation. But I have found it impossible by this means to expel more than 6 atoms of water without causing partial decomposition of the salt by disengagement of sulphuric acid. The copperas so dried acquires such an affinity for water, that it absorbs fully one-tenth of its weight of moisture from the atmosphere in the course of an hour.

Fig. 6.



Into the flask or phial *C* of my chlorometric apparatus (*fig.* 6), put 100 grains of the manganese to be tested, and into the globes *A B*, pour out of an alkalimetrical tube charged with 1000 grain measures of the above *equivalent* copperas solution, from 200 to 500 grain measures, according to the supposed quality of the manganese; then introduce through the funnel *d* some hydrochloric acid of known specific gravity (suppose 1.1), containing nearly 20 per cent. of chlorine, also from a charged alkalimetrical tube; and apply gentle heat to the bottom of the flask by placing it in a capsule of water standing over a spirit lamp. The chlorine evolved will rise up through the tube *f* (which passes merely beyond the cork), and will enter into the solution in *B* and *A*, converting it into red sulphate. Have ready some dry paper imbued with solution of red ferrocyanide of potassium (red prussiate of iron). Dip a slip of whalebone into the liquor in the globe *A*, through the funnel *e*, (represented in the figure rather too high above the globe), and touch the paper with its point. As long as it forms a blue spot, some of the iron still exists as black oxide, and the process is to be urged by the addition of a little more hydrochloric acid to the manganese, as long as chlorine gas continues to be disengaged, and while it maintains the level of the liquor in *A* above that in *B*. Whenever the liquor by the reaction of the chlorine ceases to stain the test-paper blue, more of the solution from the graduated tube must be added till it begins to do so. By the cautious administration of the hydrochloric acid on the one hand, and of the copperas liquor on the other, the term of saturation will be arrived at in a few minutes. The manganese has then produced all the chlorine which it can yield. The number of water grain measures of the liquor, or degree of its alkalimeter scale, being multiplied by forty-four, will give a product denoting the per centage of pure manganese present in the sample; or being multiplied by thirty-six, a product which will denote the quantity of chlorine by weight which 100 grains of it can serve to generate.

Since one atom of pure manganese (44 grains) in producing 36 grains of chlorine, consumes 2 atoms = 74 grains of hydro-

chloric acid, the quantity of this acid expended from its graduated tube, beyond the due proportion of chlorine obtained, will show how much of the acid is unprofitably consumed by foreign substances in the manganese. In fact, every grain of chlorine should, with pyrosulite, be generated by an expenditure of little more than 2 grains of real muriatic acid, or 10 grains weight of the dilute acid = about 9 grain measures of the graduated tube. Liquid hydrochloric acid, of spec. grav. 1.093, contains in 1000 grain-measures exactly 200 grains of real acid. Hence 100 grains of pure pyrosulite should produce about 82 grains of chlorine, and consume about 169 of real muriatic acid = 845 grain measures of liquid acid, spec. grav. 1.093. Instead of taking 100 grains of manganese as the testing dose, 10 or 20 grains may be taken, according to the dimensions of the apparatus and the exactness of the operator.

But if it be wished to obtain direct per centages of *manganese* by the graduated tubes, without the trouble of reduction, then, for a dose of 10 grains, take a solution of fresh green copperas (free from adhering moisture), containing 632 grains in 10,000 grain measures. Proceed as above directed. If the manganese be a pure peroxide, 10 grains of it will generate as much chlorine as will peroxidize exactly 1000 grain measures, or 100 degrees by the test-tube of the copperas solution. But if the manganese contain only 40 or 50 per cent. of peroxide, then 40 or 50 centigrade-measures of the said solution will be equivalent to the chlorine evolved from it by the reaction of hydrochloric acid.

If the object is, on the other hand, to obtain direct indications as to *chlorine*, then a test-solution of copperas, containing 772 grains in 10,000 grain measures, will serve to show, by the peroxidizement of each 10 grain measures, or of one degree of the centesismal scale of the test-tube, the reaction of one grain of chlorine available for bleaching, &c. in the chloride of lime or of soda, &c. The test-solutions of copperas should be kept in well-corked bottles, containing a little powdered sulphuret of iron at their bottom, which is to be shaken up occasionally in order to preserve the iron in the state of protoxide.

The manganese should always be treated with dilute nitric acid before submitting it to the above-described ordeal; and if it exhibits effervescence, 100 grains of it should be digested with the acid for a sufficient time to dissolve out all the carbonates present, then thrown upon a filter, washed and dried before weighing it for the testing operation. The loss of weight thereby sustained denotes the per centage of carbonates; and if calcareous, it will measure the waste of acid that would ensue from that source alone, in using that manganese for the production of chlorine.

That manganese is most *chlorogenous* which contains no carbonates, the least proportion of oxide of iron and of sesquioxide of manganese.

The plan of testing manganese with oxalic and sulphuric acids was originally practised by Berthier and Dr. Thomson, but is lately modified by Drs. Fresenius and Will, who employ oxalate of potash, as likely to afford more exact results. They prescribe a multiple by 3 of 993 milli-grammes = 2.979 grammes, as the quantity of manganese best adapted to experiment; but this quantity will not be found convenient by ordinary British operators.

I, therefore, take leave to prescribe the following proportions :— Into the vessel *A* of my twin-globe apparatus (fig. 3) put 100 grains of the ground manganese under trial, along with 250 grains of oxalate of potash and a little water; poise the whole in the scale of a balance; then, by gentle inclination, cause a little of the strong sulphuric acid to pass from *B* up into *A*. The oxygen thereby liberated from the manganese, reacting in its nascent state upon the oxalic acid, will convert it into carbonic acid gas; which, in passing through *B*, will deposit its moisture before escaping into the air. Whenever the extrication of gas ceases, after such a quantity of oil of vitriol has been introduced into the globe *A*, as both to complete the decomposition of the oxalic acid and to heat the mixture, withdraw the cork for a moment, to replace the carbonic acid with air, then cool, and weigh the apparatus. The loss of weight, in grains, will denote the per centage value of the manganese; that is, the proportion per cent. of perfect peroxide in the sample. If the manganese be pure no black powder should remain.

The preceding experiment is founded upon the following principle :—One atom of peroxide of manganese = 44, contains one atom of oxygen separable by sulphuric acid, and capable of converting one atom of oxalic acid into two atoms of carbonic acid, also = 44, which fly off; and cause therefore a loss of weight equal to that of the whole peroxide. To one atom of oxalic acid, which consists of three atoms of oxygen, and two of carbon—if one atom of oxygen be added, the sum is obviously four atoms of oxygen and two of carbon = 2 atoms of carbonic acid.

The apparatus (fig. 5) of Drs. Fresenius and Will, will answer perfectly well for making the same experiment, the manganese being put into *A*, with about two and a half times its weight of oxalate of potash, and the sulphuric acid being drawn over into the mixture by suction, as above described.

The economy of any sample of manganese, in reference to its consumption of acid in generating a given quantity of chlorine, may be ascertained also with the oxalic acid test. Forty-four grains of

the pure peroxide, with ninety-three grains of neutral oxalate of potash, and ninety-eight of oil of vitriol disengage forty-four grains of carbonic acid, and afford a complete neutral solution; because the one-half of the sulphuric acid = 49 grains, goes to form an atom of sulphate of manganese, and the other half to form an atom of sulphate of potash.

The deficiency in the weight of carbonic acid thrown off will show the deficiency of peroxide of manganese; the quantity of free sulphuric acid may be measured by a test-solution of bicarbonate of potash, and the quantity neutralized, compared to the carbonic gas produced, will show, by the ratio of 98 to 44, the amount of acid unprofitably consumed.

REMARKS
ON MR. MOWBRAY'S NEWLY INVENTED PROCESS
FOR PREPARING
TINCTURA FERRI SESQUICHLORIDI.

BY R. PHILLIPS, F.R.S., &c.,
And Honorary Member of the Pharmaceutical Society.

Mr. MOWBRAY's communication contained in the last number of the PHARMACEUTICAL JOURNAL, entitled "Illustrations of our Pharmacopœia," appears to have had the threefold object of criticising the Pharmacopœia, and of my translation of that work, and of remedying the defects of the formula for preparing the tinctura ferri sesquichloridi.

With Mr. Mowbray's critical observations I shall, on the present occasion, intermeddle very little, but confine my remarks to his formula for preparing the medicine above named; and, if I do not mistake, the results of my examination will enable any one acquainted with the subject to form a just estimate of Mr. Mowbray's correctness as a critic, by comparing it with his skill as an inventor.

I need hardly state that the tinctura ferri sesquichloridi is prepared by dissolving sesquioxide of iron in hydrochloric acid, and mixing the solution with spirit of wine. Mr. Mowbray considers, though groundlessly so, that the sesquioxide of iron of the Pharmacopœia is unfit to be employed in preparing this tincture, because it sometimes contains a little protoxide of iron; now, even if this objection were well founded, nothing would be easier than to obviate it by adding a little nitric acid to the solution of sulphate of iron previously to decomposing it. So simple a mode of procedure is not, however, in accordance with Mr. Mowbray's taste, and he prefers the following process, which he "strongly recommends," and states to be "sufficiently facile to

be accomplished without much skill on the part of the operator." The following is the process proposed, and the diagram by which the chemical changes induced are explained :—

"Take of Iron filings, ℥ij.

Hydrochloric acid (sp. gr. 1.160, by troy weight), ℥v. ℥vij.

Digest in a Florence flask, assisting the complete saturation of the acid at the end of the process by a gentle heat.* When all action has ceased filter the liquid, and evaporate to four fluid ounces.

Next, weigh out

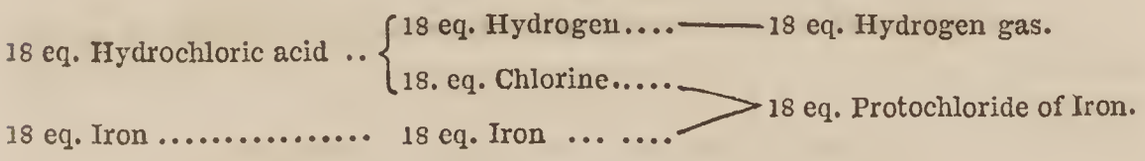
Pure sulphate of Iron (crystals powdered), 250 grs.

Hydrochloric acid (sp. gr. 1.16, by troy weight), ℥iij. ℥ij.

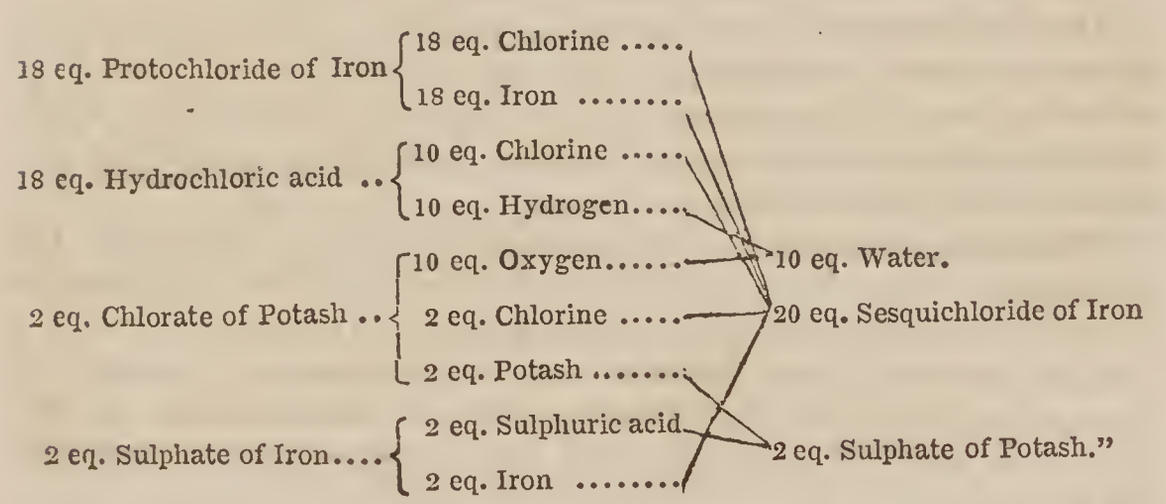
Powdered Chlorate of Potash, 246 grs.

Dissolve the sulphate of iron in the muriatic acid; mix the two solutions; then add the chlorate of potash. From the blood-red solution thus obtained, precipitate the (two equivalents) sulphate of potash by the addition of sixteen fluid ounces of rectified spirit of wine. Filter, and wash the precipitated sulphate of potash with sufficient spirit to make up twenty-six fluid ounces of tincture. One fluid ounce contains 61.4 grains of sesquichloride of iron, equivalent to 30 grains of sesquioxide, or 20.8 grains of metallic iron.

FIRST PROCESS.



SECOND PROCESS.



The extreme complexity of this process is too evident to require exposure, and the details will furnish ample matter for remark. Mr. Mowbray has stated the composition of his preparation in equivalents, instead of absolute weights; for the sake of perspicuity I shall do both.

Hydrochloric acid of sp. gr. 1.16 contains as nearly as possible 34 per cent. of real acid; consistently with this statement, 100 parts should dissolve 25.73 parts of iron; by direct experiment I found the quantity to be 24.20, the deficiency is, partly at least,

* "A bent tube should issue from the mouth of the flask, and be made to dip under a small quantity of water to prevent loss of acid. This acidified water is then returned on the filings with a view to obtain the full effect of the acid."

to be accounted for by the oxidizement which the residual iron undergoes during drying. I shall then assume that the acid contains 34 per cent. of real, and that 100 parts are capable of dissolving 25.73 parts of iron, and then 5 ozs. 7 drs. or 2820 grains, will dissolve 725 grains of the 960 of iron directed to be employed.

The 725 of iron divided by 28 will then represent 26 equivalents of iron, within a few grains, which will be converted into 26 equivalents of protochloride by dissolving in the hydrochloric acid. It follows therefore, that all the numbers of the equivalents stated in the diagram describing the first process are wrong, and require to be thus corrected :—

For 18 eq. Hydrochloric Acid... *read* 26 eq.
" 18 eq. Iron ..... " 26 eq.
" 18 eq. Hydrogen ..... " 26 eq.
" 18 eq. Chlorine ..... " 26 eq.
" 18 eq. Iron ..... " 26 eq.
" 18 eq. Hydrogen Gas ..... " 26 eq.
" 18 eq. Protochloride of Iron " 26 eq.

We come now to the diagram explanatory of what is called the second process ; it follows from what is above stated, that we should,

For 18 eq. Protochloride of Iron, *read* 26 eq.
" 18 eq. Chlorine ..... " 26 eq.
" 18 eq. Iron ..... " 26 eq.

Then follow 18 equivalents of hydrochloric acid, which I presume were intended to have been 10 equivalents, for they are stated to contain 10 equivalents of chlorine and 10 equivalents of hydrogen ; the statement, however, even thus mended is incorrect, for three ounces two drachms of hydrochloric acid or 1560 grains, are equal to rather more than 14 equivalents, so that we must,

For 18 eq. Hydrochloric Acid, *read* 14 eq.
" 10 eq. Chlorine ..... " 14 eq.
" 10 eq. Hydrogen..... " 14 eq.

Two equivalents of chlorate of potash are as nearly correctly represented as 246 to 248 ; 250 of sulphate of iron do not however represent two equivalents, being 28 less.

In the next place,

For 10 eq. Water ..... *read* 10 eq. Water *and* 4 *eq. Hydrogen.*
" 20 eq. Sesquichloride of Iron " 28 eq., that is,

supposing 278 grains of sulphate of iron to have been used instead of only 250 as directed.

If we admit the weight of the two equivalents of sulphate of potash to be correctly stated, we must also admit, that they are composed of 71.9 sulphuric acid + 95.2 potash, instead of 80 + 96.

It may be further observed, that two equivalents of oxygen have fairly escaped out of the diagram, for it will be seen that the two equivalents of sulphate of iron are represented as con-

sisting of sulphuric acid and *metallic* iron, instead of the oxide of the metal; this omission of two equivalents of oxygen is the more to be regretted by Mr. Mowbray, because he might have paired them off with two of the four equivalents of hydrogen, which I have shown to be in excess.

Although this diagram is a most deplorable specimen of patch-work, I must do Mr. Mowbray the justice to observe, that he has succeeded in helping out his erroneous facts by a correct calculation—or, at any rate, one which is much more nearly so than could have been expected under the circumstances of the case. We learn from the diagram that the various substances which he employs produce 20 equivalents of sesquichloride of iron, containing, of course, 20 equivalents of the metal, or 560 grains, and these, by the addition of the spirit, are to be made into 26 fluidounces of tincture, one fluidounce of which he says, contains "61.4 grains of sesquichloride of iron, equivalent to 30 grains of sesquioxide, or 20.8 of metallic iron;" and in point of fact, if we divide 560 by 26, we shall obtain 21.5 as the quantity of metallic iron, instead of 20.8—a difference which might easily arise from the unavoidable error of experiment—if indeed one had been made. There cannot be the slightest doubt that this result, which agrees so well with the errors of the diagram, is entirely derived from calculation; for could the process have been followed, and if it had been submitted to experiment, the quantity of iron must have amounted to about 30 grains, instead of 20.8, in a fluidounce of the tincture.

I have twice attempted to carry this process into effect, and I will add another reason to that above given, for supposing that Mr. Mowbray never tried this "facile process," which he "strongly recommends:" before the solution of protochloride of iron was evaporated down to the quantity directed, crystals of the salt began to form and deposit, so much so indeed, that on operating on half the quantity directed by Mr. Mowbray, I found that the "fluid" protochloride of iron, which was to be added to the sulphate dissolved in the hydrochloric acid, consisted, when cold, of about one fluidounce of a very thick solution of protochloride of iron, and of *solid* crystallized protochloride, occupying the measure of about a fluidounce and a half.

In concluding I may remark, that under the circumstances which I have described, this formula for obtaining the tinctura ferri sesquichloridi may be classed with a process alluded to in page 173, vol. xxi, of the *Medical Gazette*, where it is stated, that "a new vegetable salt, perfectly soluble, having for its base the active principle of the chirayita herb, prepared by the discoverer, G. M. Mowbray," was found by Dr. Schweitzer to be sulphate of quina.

PRECIPITATED CHALK.

The extensive use which "precipitated chalk" has recently acquired, as a substitute for the impure "prepared chalk," and the high price which, until lately, has been charged for the former as compared with the latter, have led to several inquiries from correspondents, as to the best and most economical method of making a good "Creta Præcipitata." We have more than once alluded to this subject in our "Notices to Correspondents;" we have also had occasion to publish an account of what appeared to be a fraudulent substitution of sulphate of lime for precipitated chalk, supplied at a greatly reduced price. Our last number contained a letter from Mr. Woolley, of Regent Street, a manufacturing chemist, recommending a process for the simultaneous preparation of precipitated chalk and purified charcoal; which letter was accidentally inserted without some observations that were intended to accompany it. If this process has been adopted by any manufacturers, we fear that the precipitated product will be found to contain more phosphate than carbonate of lime. Mr. Woolley directs hydrochloric acid to be added to animal charcoal (bone charcoal), and the mixture to be stirred while effervescence continues. The solution is then to be filtered, and precipitated with carbonate of soda.

Bone charcoal, according to Dumas, contains ten per cent. of carbon, and eighty-eight per cent. of phosphate and carbonate of lime, together with small quantities of carburet or silicet of iron and sulphuret of calcium.* On treating this with hydrochloric acid, effervescence takes place, partly from the decomposition of the sulphuret of calcium, and disengagement of sulphuretted hydrogen, but principally from the liberation of the carbonic acid of the carbonate of lime, while chloride of calcium remains in solution. But while these reactions are taking place there is also a portion of phosphate of lime dissolved; and this proportion will be considerable in the process alluded to, as the quantity of hydrochloric acid directed to be used is very much more than would be required for decomposing the carbonate of lime and sulphuret of calcium. The filtered liquor, then, will contain phosphate of lime dissolved in hydrochloric acid, together with solution of chloride of calcium; and on adding the carbonate of soda to this, the phosphate of lime will be precipitated as well as the carbonate, resulting from the decomposition of the chloride of calcium.

We have obtained some of the precipitate according to this process, with the view of ascertaining the proportion of phosphate

* See Pharmaceutical Journal, vol. ii., p. 134.

that would be present. In our experiment, we left the hydrochloric acid in contact with the charcoal for about an hour, and after adding the carbonate of soda to the filtered solution, obtained a precipitate, which, when washed and dried, amounted to very nearly half the original weight of the charcoal. This is nearly twice as much precipitate as Mr. Woolley mentions, but the quantity will, of course, depend on the strength of the acid employed, and the time during which it is left in contact with the charcoal. On examining the precipitate, it was found to contain only twenty-two per cent. of carbonate of lime, the remainder being phosphate of lime. Supposing the precipitate obtained by Mr. Woolley to contain the whole of the carbonate, with a smaller proportion of phosphate, still the latter would constitute a large proportion of the product.

The presence of phosphate of lime in this product may be detected by dissolving the powder in nitric or hydrochloric acid, and adding solution of ammonia, which will precipitate the phosphate of lime. This may be separated by filtration, and the remainder of the lime thrown down by carbonate of soda or of potash. We have, however, determined the proportion of carbonate of lime present in the powder under consideration, by estimating the quantity of carbonic acid disengaged during the solution of the powder in nitric acid.

It is evident then, that Mr. Woolley's process cannot be applied for the preparation of *pure* precipitated chalk. There is no difficulty, however, in procuring this product, and we have already in a former number alluded to the process best adapted for the purpose. It is as follows:—

Take of White Marble 1 part.
Pure Hydrochloric Acid, $2\frac{1}{4}$ parts.
Carbonate of Soda (crystals), 3 parts.
Water, a sufficient quantity.

Dissolve the marble in the hydrochloric acid, previously mixed with two parts of water, and dilute the solution with four parts more of water. Dissolve the carbonate of soda in twelve parts of water. Mix the solutions, and collect, wash, and dry the precipitate.

ON THE EMPLOYMENT OF COCHINEAL IN HOOPING-COUGH.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—The formula recommended by Dr. Cajetan Wachtl, of Vienna, and given in a late number of your journal, for the preparation of cochineal, is objectionable, inasmuch as, accord-

ing to his own admission, the solution becomes acid in a few hours, and unfit for use.

I have employed this remedy for the last twenty years in hooping-cough with the most satisfactory results. A peculiar acid is generated in the system by the disorder, which may be detected in the excretions from the stomach, and which, in my opinion, is the exciting cause of the spasmodic action of the glottis, producing the "whoop." It is obviously desirable, therefore, to neutralize this acrid condition of the first passages, in order to obtain the full advantage of the antispasmodic and anodyne properties of the cochineal; and for this purpose the *alkaline solution* is invaluable. It is of a deep purple or violet hue, will keep a long time without change, and the active powers of the cochineal are not impaired by the combination.

The following is the form:

Take of Carbonate of Potassa, a drachm
Cochineal, a scruple
Boiling water, eight ounces
The dose is a teaspoonful three time a-day.

The saccharine solution of Dr. Wachtl is extremely liable to become acid, and moreover to disagree with a stomach already disordered by disease.

I am, Sir, your most obedient Servant,

R. H. Allnatt, M.D.

4, *Parliament Street, Whitehall,*
Feb. 3d, 1844.

CONFECTIO FERRI COMPOSITUS.

Take of Clinker, freed from all impurities and reduced to an impalpable powder . . . . . 8 ounces
Carbonate of Magnesia . . . . . ½ an ounce
Powdered Ginger . . . . . 1 drachm
Treacle a sufficient quantity to form the whole into an electuary.

[The above was sent for publication by Mr. Heathcote, of Gosport, who informs us, that he received it from Dr. Watson, the original prescriber, and that it is the preparation in frequent use in Bath. Mr. Heathcote has favoured us with a specimen of the clinker, observing that it may readily be procured at any blacksmith's forge. It has a bluish black colour.—"M. P. S." (Bath) who has favoured us with a similar formula, although slightly differing in the proportions, observes, that the bluest and heaviest clinker should be selected.]

BOOKS RECEIVED.

New Methods of Alkalimetry, *and of determining the Commercial Value of Acids and Manganese.* By Drs. C. R. Fresenius and H. Will, *Chemical Assistants in the University of Giessen.* Edited by J. Lloyd Bullock, *late of the Giessen and Paris Laboratories. Taylor and Walton.*

For a notice of this work, we refer our readers to Dr. Ure's paper on the subject in this number.

We intend to give, in our next number, an extract from the chapter on Chlorometry, thinking it may be interesting to some of our readers to compare the new process of Drs. Fresenius and Will with that of Dr. Ure.

Lectures on Electricity; *comprising Galvanism, Magnetism, Electro-Magnetism, Magneto and Thermo-Electricity.* By Henry M. Noad, Author of "*Lectures on Chemistry*," &c. *A new and greatly enlarged Edition, illustrated by nearly* 300 *woodcuts.* 8vo, pp. 457. *George Knight and Sons, Foster Lane.*

A Manual of Medical Jurisprudence. By Alfred S. Taylor. Small 8vo, pp. 679. *John Churchill.*

Lessons on Chemistry, *for the use of Pupils in Schools, Junior Students in Universities, &c.* By William H. Balmain. Small 8vo, pp. 208. *Longmans and Co., Paternoster Row.*

A practical Manual *of the Microscophical Characters of the Bloods, Secretions, Urinary Deposits, &c.* By John William Griffith, M.D., F.L.S., &c. Small 8vo, pp. 61. *R. and J. E. Taylor, Red Lion Court, Fleet Street.*

On the Successful Treatment and Prevention of Consumption, Scrofula, *&c.* By J. J. Furnivall, M.D. *Baillière, Regent Street.*

Anatomical Manipulation; *or, the Methods of pursuing Practical Investigations in Comparative Anatomy and Physiology. Also, an Introduction to the Use of the* Microscope, *&c., and an Appendix.* By Alfred Tulk, M.R.C.S., M.E.S., *and* Arthur Henfrey, A.L.S., M. Mic. S. *John Van Voorst, Paternoster Row.*

TO CORRESPONDENTS.

CHLORIC ETHER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—I shall be glad to be informed, whether there be such a compound as *chloric ether*, *i.e.* a combination of chloric acid ($Cl\ O^5$) and ether ($C_4\ H_5\ O$). Many medical men are in the habit of writing *ether chloric.* and *ether hydrochloric.* indiscriminately, and I imagine that few dispensing Chemists are aware whether there exists more than one preparation of the kind. A few months ago I was asked for *muriatic ether*; having none but *chloric ether* in my possession, in order to avoid error, I informed the party that I did not keep it. Subsequently, however, I was informed by a large manufacturer of ethers, that he knew of no such thing as *chloric ether*, and he had little doubt that *hydrochloric* or *muriatic* was generally sent out and labelled *chloric ether.* Turner only mentions *hydrochloric ether*, or chloride of ethule ($C_4\ H_5\ Cl$), and I perceive, in a recent lecture given at Bloomsbury Square, it is mentioned as "*hydrochloric* (commonly called chloric) ether." An answer to the above inquiry in the Journal may be some guide to other Members, and will oblige

London, Feb. 7th, 1844. Very respectfully, $\eta\theta\upsilon\lambda$.

[There are two compounds to which the name chloric ether has been sometimes applied. One of these results from the action of chlorine on olefiant gas: it is a yellow oily liquid, and is generally known as the *oil of the Dutch Chemists.* Its composition is $C_4\ H_4\ Cl_2$. It was termed by Dr. Thomson of Glasgow, *chloric ether.* The other may be obtained by passing hydrochloric acid gas into alcohol to saturation, and distilling the product. This is generally called *hydrochloric ether* by chemical writers. Its composition is $C_4\ H_5\ Cl$., it is therefore a chloride of ethule. The former of these is not, that we are aware of, employed in medicine; the latter, when mixed with spirit, is sometimes sold under the name of chloric ether; but the compound sold under this name appears not to be always identical. We may, perhaps, give a short article on this subject in a subsequent number.

Several Correspondents have complained of the concise manner in which Mr. Redwood's lecture on ethers was reported in our last number, and have expressed a wish to be made acquainted with more of the practical details. We therefore intend to give the information required, with a drawing of the apparatus, next month. We take this opportunity of observing, that although the evening lectures were formerly published in full on account of the general interest belonging to them, as introductory lectures on the formation of a new Society, we have found it necessary to curtail the reports of the more recent lectures, which being on specific scientific subjects derived much of their interest from demonstration, and were therefore less calculated for publication. In the above instance, the report was drawn up by Mr. Redwood himself, who gave merely an outline of the subject, omitting such details as are to be found in systematic works on Chemistry.

"Adolescens."—(1). Olive oil is prepared for the use of Watch-makers, by exposing it to a low temperature until it has become partly congealed, and then separating and preserving for use the portion that remains fluid.—(2). The spirit sold under the name of Camphine for burning in lamps is, we believe, a mixture of oil of turpentine with a species of naphtha.—(3). The composition of pyroacetic spirit is $C_3\ H_3\ O$. It has been recommended recently in some cases of phthisis, in doses of ten to twenty drops. See vol. iii., page 34 and 137.

"An Associate" (Plymouth) wishes to be informed (1), "The cause of the cold sensation in the mouth, produced by Pulv. Potass. Nitr.?" [The cause is *Pulv. Potass. Nitr.*].—(2). "The black compound formed on adding calomel to lime water?" [Protoxide of mercury].—(3). "The use of sugar in compound infusion of roses?" [To improve its flavour and promote its preservation].

"A Young Apprentice" (Ramsgate), is referred to a paper on Specific Gravities, by Mr. Fownes, in vol. ii., page 652.

X. Y. Z. (Louth).—Prepared Cochineal may be made as follows:

Cochineal.	each one ounce.
Salt of Tartar.	
Cream of Tartar.	
Roche Alum.	

Distilled Water, eight ounces.

Boil the cochineal and salt of tartar in the water, then add the cream of tartar, lastly the roche alum, and strain.

R. H. (Lichfield). Hair dye is made with hydrate of lime and litharge. For a yellow show colour, see vol. iii. p. 94.

"Atramentum" wishes to obtain, through the pages of this Journal, a *good* formula for black ink. He has tried many, but says none are *really good*.

"A Correspondent" (Great Yarmouth) wishes to be informed of the most correct method of testing the genuineness of ground pepper? [We can suggest none other than the examination of its sensible characters. The microscope would assist in this respect.]

G. S. (Devizes) wishes to find out a method of rendering linen water-proof without obstructing the light, so as to be applicable for covering a hot-bed.

"An Associate" inquires, How he may detect the adulteration of butter with lard? [Butter is a mixture of margarine, with butyrolein, butyrine, caproin and caprine. (See vol. ii., page 540.) The peculiar properties of the butter depend upon the last four ingredients. If the butter be saponified, and the soap decomposed by tartaric acid, margaric acid separates, whilst the other acids remain dissolved, and may be obtained, by distillation and separation from the water, by barytes. The quantity of these acids will determine the quality of the butter; and comparative experiments may afford presumptive evidence of adulteration. If lard be present, stearine may be detected. Our Correspondent will do well to try the specific gravities of good butter and of lard.]

W. H. (Brighton).—(1). We cannot say how long it may be found necessary to continue the two guinea subscription.—(2). The Council have power, by the Charter, to recover the certificate from those who retire from the Society.

R. M. (Ludlow).—In the fourth edition of Phillips's Translation of the Pharmacopœia, the dose of Liquor Potas. Iodid. Comp. is stated to be from ʒss to ℥ss.

"Juvenis."—For the mode of preparing "Soluble Copaiba," see vol. iii, No. 2, page 66.

"An Associate" (York), *Parnel's Elements of Chemical Analysis*, 8vo, 10*s*. 6*d*.

"Marengo."—(1). A new edition of *Thomson's Dispensatory* is just published, and was noticed in our last number.—(2). *Taylor's Medical Jurisprudence* has lately been published by Mr. Churchill, 15*s*.—(3). It is necessary to learn the Latin language *grammatically*.—(4). *Parnel's Chemical Analysis*.

"Honestus."—A Chemist is liable to a penalty for selling grains of paradise, &c., *knowing or suspecting* that they are for the use of a brewer. See vol. ii, page 549.

M. P. S.—Paper labels may be made to adhere to tin boxes by means of a solution of gum mastic in spirit of wine.

J. R., (in answer to a Correspondent at Tavistock) recommends, as a good preparation for the backs of paper labels,

Thick mucilage of Gum Arabic, 4 ounces.
Honey, 3 drachms. Mix.

"Alpha."—The question is quite unintelligible.

"Inquisitor," (Plymouth).—See the notice inside the cover of vol. iii. No. 7.

"Ignoramus."—The red or damask rose.

R. S. P. (Nottingham).—We think the publication beneath our notice; it is rather creditable than otherwise to be abused by discreditable people.

"Rusticus."—It is optional.

"Aliquis."—Nothing but perseverance can accomplish what our Correspondent desires, and time only will show whether our Correspondent, and others who think as he does, will persevere.

Mr. Allen (Bristol), wishes to know where the oil of acetabella, an American product used in strumous and scrofulous cases, may be obtained?

J. B. S.—The observations of the Chairman of the Board of Excise, in reference to the sale of spirit of wine for medicinal purposes, are reported in our last number, and our readers must use their own judgment in the interpretation of them: at the same time we may observe that no exception was made with respect to its sale as a veterinary medicine.

"Pulvere."—Yes.

"Posologist."—We have already stated, that we understand *mistura salina* to be lemon juice saturated with carbonate of potash, diluted with an equal quantity of water. This, however, is an arbitrary preparation.

"Chemist" (Devonport), should send a sample of his ore to an analytical Chemist with the customary fee.

T. T. T.—The question is very distinctly answered in vol. ii., page 656.

Mr. Ashton (of Alford), has favoured us with a few observations on "A Proposed Outline of a Bill, having for its object, the regulation of the various branches of the Medical Profession, protecting the interests of the same, with means for the perfect suppression of illegal practice within the British dominions. By Charles Clay, M.D., M.R.C.S., &c. &c."

[As the above imaginary Bill is not at all likely to go any further than the pamphlet, in which it first made its appearance, we think it quite unnecessary to notice it; at the same time we are obliged to our Correspondent for his communication, and are at all times glad to receive information on similar subjects, to be made use of when opportunity occurs].

We think it right to inform the person who sent us a letter from Northampton, that he ought to be ashamed of himself. It was immediately suspected to be a forgery, which, on inquiry, was found to be the case.

G. N.—We intend to allude to Veterinary Medicine in our next number.

Mr. Setchfield has sent us a communication on the medicinal properties of Pilula Styracis Comp. which subject would be more in place in a *medical* journal.

A Correspondent, who subscribes himself "Alembic," has sent us rather a lengthened communication, the object of which is to show that Chemists and Druggists in this country are not adequately remunerated; that a progressive improvement has taken place, and is still going forward in our body; that some of the imperfections complained of, especially in country shops, arise from circumstances not under our controul; that the heads of the medical profession were not always so learned as they now are; and that no reform can be salutary and proper, which is not based upon justice to all parties. Many of the arguments of our Correspondent have already been brought forward in this Journal (see vol. ii. p. 557; vol. iii. pp. 97 and 269), which must be our apology for not publishing the letter. A specimen of the Pharmacy of the ancient physicians, is quoted from the Pharmacopœia of Dr. Theodore Mayerne, to give a notion of the state of medicine in his day. (Similar specimens are quoted in the Historical Introduction to this Journal, pp. 8, 9, 21 and 22).

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. X.—APRIL 1st, 1844.

THE PROGRESS OF MEDICAL REFORM.

The anticipation of Sir James Graham's measure, which, we are informed, is to be laid before the House immediately after Easter, occasions some little excitement in the Profession. It appears that the Charter recently granted to the College of Surgeons has not given universal satisfaction, and several meetings of medical practitioners have been held on this subject. It is conjectured, from the nature of the Surgeon's Charter, as well as from rumours which have been circulated, that the forthcoming bill will not be in accordance with the principles advocated by those Members of the Profession who have been most active in the promotion of medical reform.

A committee has therefore been appointed, and sits daily at the Crown and Anchor Tavern, for the purpose of receiving the names of legally-qualified medical practitioners and registered students in medicine as members of an association, termed "The Medical Protection Assembly." An address has been drawn up, entitled "An Address of the Committee of the Medical Profession to the Practitioners of the British Empire," and 5000 copies have been forwarded to different parts of the country.

The object of this address is to point out those portions of the new charter which are considered objectionable, and to urge the necessity of union and a vigorous effort at this crisis in order to induce the government to modify the approaching measure in such a manner as to meet the emergency of the case.

Passing over those arguments which relate merely to points in dispute between different sections of the profession, we need only notice the urgent appeals which are made in reference to the restraint of unqualified persons. The allusions made in the above address, as well as in other articles in the medical journals, to "the ignorance of Chemists and Druggists," "the poisoning of the

public by the ignorance and negligence of Druggists' boys," &c., are rather severe and intemperate. But we recommend our brethren to take no notice of any such unguarded and uncalled-for expressions, which should be attributed to irritability arising either from prejudice or a fit of the gout.

We feel much satisfaction in looking back at the progress which our body has made during the last three years, and in observing the improvement which is taking place. The result of our experience should impel us to avoid every kind of political controversy, and to persevere with all our energy in promoting that systematic union among ourselves, and those educational measures, in which our strength consists, and which cannot fail to place us in our proper and legitimate position in the profession.

In our last number we noticed the progress which has been made in the establishment of schools of Pharmacy, and pointed out the importance of unity of design and simultaneous exertions in the several districts in which it is found practicable to institute such establishments. It is by no means desirable to multiply these branches of the Society to an unlimited extent—this would tend to diminish their usefulness by dividing their strength and advantages. Five or six effective and well-regulated schools in such localities as possess the greatest facilities for their growth, will produce more benefit than a much larger number established on a scale too limited to be kept up with spirit. But it is not only in those localities in which a School of Pharmacy is founded, that the influence of these means of education is felt. The fact that such institutions exist, and that every apprentice will be expected to avail himself of their advantages before he can rise to the rank to which he aspires, will tend to encourage studious habits and industry in the rising generation.

Much may be done by the student who is but moderately supplied with books, and who in many respects labours under disadvantages, provided his interest in his profession be awakened, and his energy be directed to that preliminary study which is calculated to prepare him for passing the examination. But little is likely

to be done by students in general while no qualification is required, and while the passport to success is not ostensibly referable to the amount of attainments in each individual. That the labours of the Society in establishing a regular pharmaceutical education, are already beginning to operate as a stimulus to our young men, is obvious from the numerous communications received from all parts of the country, containing inquiries on various scientific subjects, and requesting information as to the best works to purchase, and the course of study which should be pursued by those who are preparing for the examination. Besides the communications answered in our Notices to Correspondents, a great number of letters are constantly received, to which answers are requested by post, and the tenor of which plainly indicates a desire for improvement, no less creditable to the parties concerned, than satisfactory to those who are using every exertion to promote and extend this object.

In proportion as the plans of the Society approach to maturity, it will become practicable to afford to all our Students more definite and minute instructions respecting their early studies: we trust that the text-books of our Professors will be published, and by this means those young men who reside in remote parts of the country will be provided with the most effectual means of preparing themselves for that course of instruction which is followed in our Schools of Pharmacy, and which is arranged and conducted with reference especially to our own particular department in the profession. We trust that all will look forward to attending our Lectures, sooner or later, as a completion to their education; and when the Society has become sufficiently established to found a laboratory on an extensive scale for the accommodation of Students in the prosecution of practical Pharmacy and Chemistry, we hope it will become a common practice for young men to "walk the laboratory," as Medical Students "walk the hospitals." We threw out this idea at the time the formation of this Society was first contemplated, and look forward to the realization of this project as the climax of the undertaking.

It is satisfactory to observe, that the examination of Apprentices

has become very general, and the number of certificates forwarded to the Board of Examiners from those who desire to be registered, and to join the Society, proves that the importance of preliminary education is appreciated. The natural result of this circumstance will be the introduction into the trade of a superior class of young men; and although our classical examination is at present by no means severe, it is sufficient to exclude from the Society all those who have not been instructed in Latin and other branches of a liberal education. In process of time the severity of the examination will gradually be increased, and the respectability of our profession will be raised in proportion. We need scarcely remind our Members that, in order to effect this object with the least possible delay, it is of the highest importance to insist upon Apprentices' passing the classical examination in every instance; and since it is not necessary for them to come to London for this purpose, there is no excuse for deviating from this rule.

Among the objects contemplated in the formation of the PHARMACEUTICAL SOCIETY, we must not omit to notice the endeavour to promote the manufacture and sale of drugs of the best quality; and to check the practice of adulteration, which is so detrimental to our professional, as well as to our moral character. In this respect we have every reason to be encouraged to persevere in our labours. The attention of the profession being frequently directed to instances of impurity in articles of the Materia Medica, whether accidental or otherwise, and every opportunity being taken to disseminate information as to the best means of detecting the existence of any contamination, an improvement has lately taken place in the quality of many of the articles in daily use, and a desire appears to prevail among the Members of the Society to compete with each other in the quality of their preparations. The manufacturers of Chemicals, aware that their goods are likely to undergo an examination, and that, if found defective, they will be returned on their hands, are obliged to be additionally careful in all their preparations; and although it is probable that some of our Members may omit to subject the articles to the proper in-

vestigation, the fact that others are on the alert is quite sufficient to act as a wholesome stimulus on manufacturers in general. It is not now sufficient to make a preparation merely pleasing to the eye, it must also pass the ordeal of Chemical tests. As illustrations, we need only advert to the precipitated sulphur, oxide of zinc, nitric acid, sweet spirits of nitre, and many other preparations, the merits of which have been discussed in Meetings of the Society, or noticed in the Journal.

We may add, that arrangements are in progress for opening a communication with correspondents in the Colonies and other distant parts of the world, respecting the nature, qualities, history, and purity of those drugs which are brought into this country in a more or less prepared state, and on which our knowledge is at present defective. We have already received communications and specimens from some of our members abroad, which may be considered a commencement of this very important work.

To those who inquire, what benefit has arisen from the PHARMACEUTICAL SOCIETY, and what further advantages the Members are likely to derive from belonging to it, we need only reply, that the progress of Pharmacy in this country, as detailed in the above facts and observations, ought to be esteemed by those who respect the character of their profession, a very material advantage. But we may also notice the change which has taken place in our position in reference to the other bodies in the medical profession. Instead of being subject to incessant attacks on the ground of our neglect of the education of our junior Members, and threatened with Acts of Parliament, which, if passed into laws, would deprive us of our independence, and seriously injure us in other respects, we are now allowed to proceed unmolested in the course which we have undertaken; our progress is watched, by all unprejudiced members of the profession, with approbation and some degree of interest; and we have reason to congratulate ourselves on the reception which we have met with from the government, when it has been found desirable to make application on any subject in which our interests as a body are concerned.

We may also notice, as an indication of the increasing confidence in our body evinced by the medical profession, a resolution lately passed by the senate of the University of London. The senate requires from candidates who come up for examination, certificates of qualification in the several branches of knowledge comprised in their curriculum from the parties by whom the candidates have been instructed. According to the resolution alluded to, certificates in Practical Pharmacy are now received from Members of the PHARMACEUTICAL SOCIETY, and in order to carry out this object, official application has been made for a correct list of the Members for reference, whenever certificates from Chemists and Druggists are offered to the Board. By this resolution, Chemists and Druggists are recognised as qualified to instruct Medical Pupils in Practical Pharmacy, and Membership in the Society is recognised as a test of qualification in a Chemist and Druggist.

We must not, however, take credit to ourselves for the full amount of superiority which might seem to be implied in the above observation. The senate of the University, by receiving certificates from our members to the exclusion of other persons calling themselves Chemists and Druggists, acknowledges the Society as a body sanctioned by Royal Charter, and designed to represent and comprise all those who are duly qualified; but we should not forget that there has not yet been time to effect this object, and the compliment must rather be considered as an encouragement to us to persevere in our labours than an admission that the end has been attained.

It is satisfactory to observe, at this early period of our existence as a recognised body, that not only the University of London, but the medical profession in general, appear to look favourably upon our proceedings; and from the sentiments which we have heard expressed in various quarters, we have every reason to believe, that the pacific and dispassionate measures which have been adopted by our body, have gained for us an amount of influence which will be of essential service whenever our claims are discussed before Parliament.

LECTURES ON BOTANY.

Our readers will perceive by the notice on the cover, that arrangements are in progress with the Royal Botanical Society, which will very materially facilitate the illustration of the lectures on Botany, and give the students an opportunity of visiting the garden in the Regent's Park, which is well supplied with medicinal plants. The success of this arrangement will mainly be due to the influence and intervention of Dr. A. T. Thomson, who is a member of the Council of the above society, and who will deliver the summer course of lectures during the ensuing months of May, June, and part of July.

According to the plan which is in contemplation, the course will consist of twenty-six lectures; the first portion of which will be delivered, as before, at Bloomsbury Square, but the latter part of the course, in which the specific characters of the most important medical plants will be pointed out, will be delivered at the gardens: by which means the students will be able to see each plant in its natural state, and in cases in which specimens are sufficiently abundant, portions will be distributed among the class for examination after lecture. It is expected that the holders of tickets for the course will have personal admission to the garden in the Regent's Park, between the hours of seven and ten in the morning; and as all the plants in the garden are labelled, the students will enjoy the opportunity of becoming familiar with the characters of nearly all our indigenous medicinal plants, as well as many exotics, by observing their growth, structure, and general appearance in the intervals between the lectures, which will impress on the memory the descriptions given by the Professor.

This arrangement combines the advantage of botanical excursions, with the convenience of propinquity to the metropolis, and with this superiority over the ordinary herborizing walks, that the students will always find abundance of medicinal plants classified in the best manner, and will, therefore, never lose the benefit of an excursion for want of specimens of the right kind, a casualty to which they would be always liable, if dependent upon the fields and hedge-rows for a supply.

It has been observed in almost all medical and other schools in which Botany is taught; that this class is generally much smaller than any other; and it would appear from this circumstance, that the subject is not particularly attractive. This, however, is a delusion which ought to be dispelled. A course of lectures on Botany, with a very indifferent supply of specimens, which is unavoidable under ordinary circumstances in a town lecture-room, is deprived of its chief source of interest and utility.

However minute and explicit may be the description given of each plant, if the student be not provided with a specimen, to aid his memory and keep alive his perceptive faculties, the words of the description make but a temporary impression, and the repetition of technical terms tends rather to bewilder the mind. Even if specimens, in a more or less withered state, be handed round the room, the student can scarcely become sufficiently acquainted with their characters to recognise them with facility, when growing in the fields. As well might an artist attempt to learn to depict the symmetry and peculiarities of the human form by studying the mouldering remains in a charnelhouse. But when the plants are presented to the student in the living state, and described in a familiar manner by the professor, when the interest arising from this mode of instruction is increased by the charms of a well-regulated garden, stocked with good specimens in a healthy condition, labelled, and well arranged, it would be impossible for any person, possessing a mind capable of cultivation, to attend a course of botanical lectures under such circumstances, without deriving much practical knowledge, and becoming deeply interested in the subject.

Accordingly it has been found by experience, that in those cases in which the privilege of visiting a botanical garden, or taking frequent excursions in the fields, has been associated with the instruction afforded by the lecturer on Botany, the number of students has greatly increased, and this branch of knowledge has enjoyed that popularity which it deserves. This was the case with the lectures of the Apothecaries' Company, which, until a garden was provided, were very much neglected, but which are now in a flourishing state. We hope the same result will ensue from the privilege about to be afforded to the students of the Pharmaceutical Society; and we trust that the endeavours of the Council and the exertions of the Professor in providing that accommodation, which was felt to be so much required, will secure the attendance of a much larger number of pupils than we had last Session.

The value of a knowledge of Botany to the Chemist is so great, that it is impossible for him to be too much impressed with the duty of studying this branch of science. But it is needless to enlarge upon this subject; a great proportion of our medicinal substances being derived from the vegetable kingdom, and danger or even loss of life being likely to ensue, in many cases, from one plant or portion of a plant being mistaken for another, it is obvious that those who furnish these articles to the public, whether in the simple state or prepared, cannot possibly perform their duty, unless they are acquainted with the specific characters of the plants, and thus enabled to distinguish one from another.

VETERINARY MEDICINE.

In an early number of this Journal, we made some observations on the ignorance which prevails on the subject of horse and cattle medicines, the empirical manner in which this branch of the medical art is too often followed, and the necessity which exists for Chemists and Druggists to pay some attention to it. It was remarked by Mr. Bracy Clarke, some years ago, that the introduction of the term "Veterinary Surgeon" had produced a beneficial influence, and tended to raise the character of the class, by creating a distinction between men who had some pretensions to education, and the "Farriers", or "Horse-doctors," whose ignorance was proverbial. Without attributing any mysterious influence to the epithet, we quite agree in the opinion that any circumstance which tends to distinguish the qualified members of a class from others, cannot fail to produce a good effect.

The members of the Odiham Agricultural Society, in May, 1785, first took into consideration the most likely means of encouraging the introduction of *scientific farriers*, but it was not until August, 1789, that they determined to carry it into execution, by sending two young men for instruction in a medical school in France. In that year, however, Mr. Sain Bell came to England, and in the following year, offered himself as a professor of the veterinary art. In February, 1791, he was appointed; and in Jannary, 1793, the infirmary of the Veterinary College was regularly opened for the reception of diseased horses.

The establishment of the Veterinary College assisted materially in promoting the improvement which has taken place, and although that Institution was not protected by Act of Parliament, or even sanctioned by Royal Charter, it has been the means of furnishing education to a great number of veterinary practitioners, and the diploma of the College is much esteemed and widely circulated, as a test of qualification.

A similar College was founded in Edinburgh, by Mr. Dick, in the year 1829, and the study of Veterinary Medicine has now been reduced to a systematic form, which has occasioned a favourable revolution in the body of practitioners in that department.

Within the last few years a great advance has been made, and a recent event has placed the veterinary art in the position of a profession. Her Majesty has been pleased to grant to Thomas Turner, William Joseph Goodwin, Thomas Mayer, William Sewell, William Dick, Charles Spooner, James Beard Simmonds, and such other persons as now hold certificates of qualification

from the Veterinary College of London, or the Veterinary College of Edinburgh, or hereafter may become students of either of the said Colleges, or such other Veterinary College as now is, or hereafter shall be established for the purpose of education in Veterinary Surgery, whether in London or elsewhere in the United Kingdom, and which may hereafter be sanctioned by the Royal sign manual in that behalf, and should pass such examinations as may be required by the Royal College of Veterinary Surgeons—*A Royal Charter of Incorporation*, that they may henceforth be one body politic and corporate, by the name and title of the ROYAL COLLEGE OF VETERINARY SURGEONS. The Charter further declares, that the veterinary art, as practised by the members of the said body politic and corporate, shall henceforth be deemed, and taken to be, and recognised as a profession; and that the members of the said body politic and corporate, *solely* and *exclusively* of all other persons whomsoever, shall be deemed, and taken, and recognised to be, members of the said profession, or professors of the said art; and shall be known and distinguished by the name and title of Veterinary Surgeons. The Charter also contains the usual provisions for the government of the body, and for maintaining the rights and privileges of the members.

The natural consequence of this acquisition will be to raise the character and respectability of the veterinary profession—to afford facilities for the prosecution and advancement of the science, and thus to induce a superior class of men to embark in it.

But these proceedings refer more particularly to the medical and surgical departments, and we notice them as an introduction to a few observations on Veterinary Pharmacy, which comes more within our sphere, and which we are obliged to defer until next month.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

PHARMACEUTICAL MEETING,
MARCH 13th, 1844.

MR. PAYNE, PRESIDENT, IN THE CHAIR.

OBSERVATIONS ON CERTAIN PLANTS OF THE GENUS PIPER.

BY MR. T. R. N. MORSON.

From a very early period, and amongst different races of people totally unknown to each other, plants of the genus Piper (a genus containing several hundred species known to botanists) have been selected and extensively used as condiments and remedial agents. The most universally employed is the fruit of the Piper nigrum, the quantity of which consumed in Europe alone almost exceeds belief, and which is too well known, as regards its general character, to require any observation. It still holds its place in our Materia Medica, and possessing as it does in an eminent degree the chemical properties of the family to which it belongs, and of which it forms the type, is assuredly entitled to our especial attention; its tincture would be an agreeable adjunct to many formulæ, and I know no reason why it has not been more generally employed, except that it savours more of the culinary than of the Pharmaceutical laboratory. If this pepper be subjected to distillation, it yields a considerable quantity of essential oil; the quantity most probably varies, but in one experiment I obtained two per cent; treated with boiling alcohol, it yields an extract rich in piperine, a peculiar crystallizable substance, first discovered by Oerstaedt, who described it as a new alkaloid, and published a description of its muriate. How he fell into this error, it is difficult to conceive, as it has no alkaline properties, and will not form salts. His experiments were repeated by Pelletier and Poutet, and the true nature of piperine determined.

The next pepper of general use in Europe is the Piper longum, which is also in our Pharmacopœia. It was chemically examined, in 1825, by M. Dulong, a Pharmacien of Astafort, who wrote a long paper on this substance, in which he found essential oil, a hot concrete fatty matter, united with some of the common constituents of vegetable substances.

The Piper cubeba, another of the family, has of late years been very extensively employed; it is, however, by no means a new remedy—descriptions of it may be found in very old works, and

it was employed like other pepper in the art of cookery. Its use for the purposes to which it is now applied as a medicine, is of recent date, and attributable to an account of its use by the natives of the Indian Islands, or the Europeans residing there, given by Crawford in his *History of the Indian Archipelago.*

This species of pepper contains, when fresh and good, nearly 10 per cent. of essential oil. Several analyses of this fruit have been made and published, but they differ considerably, and are far from satisfactory. The crystalline substance, to which the name of cubebine has been given, requires a careful examination, and will then probably be found identical with piperine. I hope shortly to be able to bring before the Society some observations on this substance, and on piperine obtained from other sources.

Many other plants of this great family have been the subject of chemical investigation and employed as medicines, more especially the Piper betle, Piper caudatum, Piper capense, Piper citrifolium, Piper amalago, Piper angustifolia, Piper methisticum, &c.: on these two last peppers, as new and interesting, I will make a few observations.

A Peruvian plant, the Piper angustifolium of Ruiz and Pavon, has recently been introduced into this country, under the native name of matico. The leaves and flowering tops of the plant are the parts imported and introduced by Dr. Jeffreys, of Liverpool, to the notice of the profession as a most valuable remedy in diseases of the genital organs and rectum. He considers its activity to depend on its essential oil, and recommends its use in the form of infusion or decoction, in the proportion of from half-an-ounce to one ounce to the pint of water. Dr. Hunter Lane, also, has written on this medicine, and used it in various cases. The leaves are covered with fine hair, and have been recommended as a styptic; which property depends, I think, on their structure, and not on their chemical composition. The natives use this plant for similar diseases.

The leaves of matico, treated with boiling alcohol, yield a quantity of dark-green extract, almost entirely soluble in sulphuric ether; warm to the taste, and containing a notable quantity of vegetable wax, resembling in its properties the wax obtained from lac, and of which a very small proportion, dissolved in boiling alcohol, will cause it to solidify on cooling. Its active properties seem to reside in its resin and essential oil, as is the case with others of its family, for although it yields a large proportion of aqueous extract (one-fourth of its weight), yet this extract has little, if any, of the peculiar properties of the plant—it is slightly bitter and astringent, but possesses even these properties in no remarkable degree; it is therefore evident that the alcoholic extract or tincture should be employed, perhaps also the infusion.

PIPER METHISTICUM.

[We shall endeavour to obtain a drawing of Piper angustifolia for publication next month.]

Piper angustifolia or Matico has been used by several practitioners, who speak highly of its useful properties in diseases of the mucous membrane; and I may, without expressing any very sanguine expectations of its obtaining a superiority over others of its family, recommend its being well tried, as it is the only instance of the leaves of a piper imported for medical use; and as we are well aware the peculiar properties of plants reside in very variable quantity in different parts of their structure, it is desirable to be enabled to investigate them all, a knowledge of facts being in this matter very important.

Mr. Girdwood has favoured me with a statement of several cases, in which it has been found useful.

One of the most interesting and remarkable of the plants of this family remains to be noticed—the Piper methisticum, ava or kava of the Sandwich or Tonga Islands: the name of Piper inebrians has also been given to this pepper from its property of intoxicating. The natives of these islands employ the root of this plant, occasionally only the leaves, but it is in its enormous root and stem that its properties chiefly reside. I am not aware of any chemical examination of this substance, although it certainly merits a very attentive one. In the voyage of Captain Cook, you have a description of cava-drinking, but the best account of the employment of it is given by Mariner, in his interesting *History of the Tonga Islands*, in which he resided for many years; it is as follows:

"The root is split up with an axe, or any such instrument, into small pieces; and being thus sufficiently divided and scraped clean with mussel-shells, &c., is handed out to those in attendance to be chewed. There is now heard an universal buzz throughout a part of the company, which forms a curious contrast to the silence that reigned before; several crying out, 'Give me some cava! give me cava!'—each of those who intend to chew it crying out for some to be handed to them. No one offers to chew the cava, but young persons who have good teeth, clean mouths, and have no colds; women frequently assist. It is astonishing how remarkably dry they preserve the root, while it is undergoing this process of mastication. In about two minutes, each person having chewed his quantity, takes it out of his mouth with his hand, and puts it on a piece of plantain or banana leaf, or sometimes he raises the leaf to his mouth, and puts it off his tongue in the form of a ball of tolerable consistence, particularly if it be dry cava root. The different portions of cava being now all chewed, which is known by the silence that ensues, a wooden bowl, of about three feet in diameter and about one foot in depth in the centre, is placed on the ground before the man who is to make the infusion. In the meanwhile, each person who sits at any distance, passes on his portion of chewed root, so that it is conveyed from one to another, till it is received by three or four persons, who are actively engaged going from one side to the other collecting it, and depositing it in the wooden bowl; it is not, however, thrown in promiscuously, but in such a way that each portion is distinct and separate from the rest, till at length the whole inside of the vessel becomes thickly studded, beginning at the bottom and going up on every side towards the rim: this is done that a judgment may afterwards be formed of the quantity of beverage it will make, as each portion is disengaged from the leaf, the leaf is thrown anywhere on the ground.

"The cava being thus deposited in the bowl, those persons who had been busy collecting it retire to their places and sit down; the man before whom the bowl is placed, now tilts it up a little towards the chief, that he may see the quantity of its contents, saying, 'This is the cava chewed.' If the chief thinks there is not enough, he says, 'Cover it over, and let there come a man here.' The bowl is then covered over with a plantain or banana leaf, and a man goes to receive more cava root to be chewed as before; but if it be thought there is a sufficiency, he says 'Mix.' The two men, who sit one on each side of him who is to prepare the cava, now come forward a little, and making a half-turn, sit opposite to each other, the bowl being between them; one of these fans off the flies with a large leaf, while the other sits ready to pour in the water from cocoa-nut shells, one at a time.

"Before this is done, however, the man who is about to mix, having first rinsed his hands with a little of the water, kneads together the chewed root, gathering it up from all sides of the bowl, and compressing it together; upon this the mataboole, an attendant, says, 'Pour in the water,' and the man on one side of the bowl continues pouring, fresh shells being handed to him, until the mataboole thinks there is sufficient, which he announces by saying, 'Stop the water.' He now discontinues pouring, and takes up a leaf to assist the other in fanning. The mataboole now says, 'Mix it everywhere equally, and make it firm'—*i. e.* bring the dregs together in a body.

"Things being thus far prepared, the mataboole says, 'Put in the fow;' which is the bark of a tree stripped into small fibres, and has very much the appearance of willow-shavings. A large quantity of this fibrous substance, sufficient to cover the whole surface of the infusion, is now put in by one of those who sit by the side of the bowl, and it floats upon the surface. The man who manages the bowl now begins his difficult operation. In the first place, he extends his left hand to the further side of the bowl, with the fingers pointing downwards, and the palm towards himself; he sinks that hand carefully down the side of the bowl, carrying with it the edge of the fow; at the same time his right hand is performing a similar operation at the side next to him, the fingers pointing downwards, and the palm presenting outwards. He does this slowly, from side to side, gradually descending deeper and deeper, till his fingers meet each other at the bottom; so that nearly the whole of the fibres of the root are by these means enclosed in the fow, forming, as it were, a roll of about two feet in length, lying along the bottom from side to side, the edges of the fow meeting each other underneath. He now carefully rolls it over so that the edges overlapping each other, or rather intermingling, come uppermost. He next doubles in the two ends, and rolls it carefully over again, endeavouring to reduce it to a narrower and firmer compass. He now brings it cautiously out of the fluid, taking firm hold of it by the two ends, one in each hand (the back of the hands being upwards); and raising it breast-high, with his arms considerably extended, he brings his right hand towards his breast, moving it gradually onwards, and whilst his left hand is coming round towards his right shoulder, his right hand partially twisting the fow, lays the end which it holds upon the left elbow, so that the fow lies thus extended upon that arm, one end being still grasped by the left hand. The right hand being now at liberty, is brought under the left fore-arm (which still remains in the same situation), and carried outwardly towards the left elbow, that it may again seize in that situation the end of the fow. The right hand then describes a bold curve outwardly from the chest, whilst the left comes across the chest, describing a curve nearer to him, and in the opposite direction, till at length the left hand is extended from him, and the right approaches to the left shoulder, gradually twisting the fow by the turn and flexures of that wrist; this double motion is then retraced, but in such a way (the left wrist now prin-

cipally acting), that the fow, instead of being untwisted, is still more twisted, and is at length again placed upon the left arm, while he takes a new and less constrained hold.

"Sometimes the fibres of the fow are heard to crack with the increasing tension, yet the mass is seen whole and entire, becoming more thin as it becomes more twisted, while the infusion drains from it in a regularly decreasing quantity, till at length it denies a single drop. He now gives it to a person on his left side, and receives fresh fow from another in attendance on his right, and begins the operation anew, with a view to collect what before might have escaped him, and so on, even a third time, till no dregs are left, save what are so fine, and so equally diffused through the whole liquid, as not to be thus separated.

"During the above operation, various people are employed making cava cups of the unexpanded leaf of the banana tree, which is cut into lengths of about nine inches, each piece being then unfolded, is nearly square, the two ends are next plaited up in a particular manner, and tied with a fibre of the stem of the leaf, forming a very elegant cup, not unworthy of imitation.

"The infusion of cava being now strained, the performance of which generally occupies about a quarter of an hour or twenty minutes, the man at the bowl calls out, 'The Cava is clear.' The mataboole replies, 'Squeeze out,' alluding to the peculiar operation of filling the cups. Two or three now come forward and sit down near the bowl, bringing with them and placing on the ground several of the cups; one then rises and holds with both hands a cup to be filled, standing a little on one side, and holding the cup over the middle of the bowl, so that his body does not obstruct the view of others. The man who manages the bowl, fills the cup by dipping in a portion of fow rolled together, and which, when replete with the liquid, he holds over the cup, compressing it so that the infusion falls into it, to the quantity of about the third of a pint. The one who has the cup now turns and stands a little on one side, with his face towards the chief, at the same time one of those who have been described sitting by the side of the bowl and employed fanning it, cries out with a loud voice, 'The cava is deposited' (*i. e.* in the cup); the mataboole replies, 'Give it to——,' naming the party who is to have it, who hearing his name announced, claps the hollow part of his hands together, to signify whereabout he is seated; the cupbearer then advances, and presents it standing, unless it be a chief, when he presents it sitting."

Now, it clearly follows from this process, that vinous fermentation cannot take place, as the beverage is drunk immediately it is prepared; its effects, therefore, must be attributed to some narcotic property existing in the root, and which has never, I believe, been separated or investigated; it is, however, worthy of remark, that the peppers were formerly united in one great family with the hemps, and that the latter are narcotic.

The root and stem of this plant abound in ligneous fibre, which, with starch (also existing in immense quantity), constitutes its great bulk. From a pithy centre, consisting of lax cells filled with starch globules, proceed plates of woody and vascular tissue, alternating with small cells filled with starch. For some magnified drawings of this root I am indebted to my friend Mr. Alfred White, the drawing of the plant itself is copied from an unpublished one in the collection of the late Sir Joseph Banks, in the British Museum. (See page 473).

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

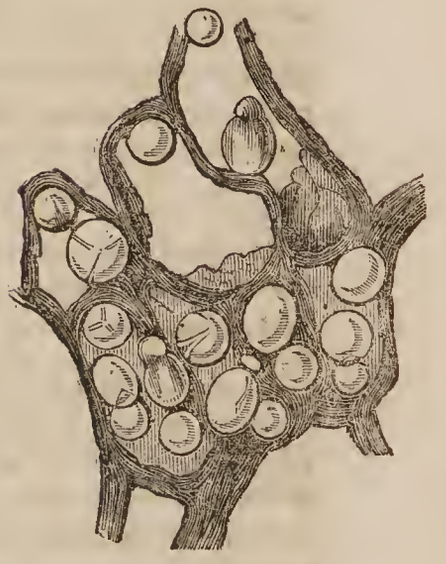


Fig. 1. Cross section of the stem (natural size), which is composed of an outer layer (*a*), in which plates of woody and vascular tissue, alternate with masses of small cells, filled with starch globules, and likewise a few vessels; and of a central accumulation of lax cells, filled with starch globules; and through which pass large bundles of vascular and woody tissue.

Fig. 2. Represents the outer layer, magnified twelve times; (*a*) being the woody and vascular plates, and (*b*) those of cellular tissue.

Fig. 3. Is a portion of the cellular mass, magnified twelve times; (*a*) the vascular bundles, surrounded by the cellular tissue.

Fig. 4. A longitudinal section of one of the vascular bundles (of the central part), with its surrounding cells and starch globules: magnified twenty-five times.

Fig. 5. A few cells (of the centre), magnified 200 times; showing the manner in which the globules of starch are placed.

If this root be distilled it yields a most agreeable essential oil, easily recognizable, and differing from that of other peppers. Treated with boiling alcohol, it yields an extract pungent to the taste, leaving a remarkable impression on the tongue and throat, and from which I have succeeded in obtaining a crystallizable principle, in a state of great purity, which I consider as identical with piperine, although its mode of crystallization is somewhat different—a difference probably caused by the quantity operated upon. I hope shortly to be able to present to the society a chemical history of this substance, and the result of some trials made to ascertain its medicinal properties; for if we believe the accounts given by travellers, a strong infusion will produce stimulating and sedative effects, lasting for twenty-four hours, and leaving the patient in profuse perspiration—effects which render it eminently worthy of medical investigation. The abuse of it by the natives of the Tonga Islands, who are passionately fond of it, is said to render them thin and emaciated, and they are reported to use it to counteract great obecity; but all these statements require confirmation.

Mons. Lesson, in the *Bulletin des Sciences Medicals*, published about twenty years since, a curious notice of this plant, which he states is also employed in Carolina by the natives to prepare a drink which they call Scheaka: he mentions its use by them in rheumatism, and diseases of the genital organs, and terminates with the following observations:

"The English Apothecaries have recently introduced the cava root into all their shops, and extol the tincture as a remedy in chronic rheumatism, &c. Numerous ships are now employed in transporting this root to England."

Where Mons. Lesson obtained his information I know not; he would certainly have found it difficult to obtain this root of any Apothecary or Chemist, although it has been employed in England without any very accurate experiments having been made.

ON MR. PATTINSON'S MAGNESIA ALBA,

AND

ON THE COMPOSITION OF THAT SUBSTANCE GENERALLY.

BY GEORGE FOWNES, PH. D.

HAVING been presented by Mr. Morson with a specimen of the *magnesia alba*, prepared by the new and very ingenious process of Mr. Pattinson, described at the last Pharmaceutical Meeting,*

* PHARMACEUTICAL JOURNAL, vol. iii. p. 424.

I lay before the Society a short notice of the result of its examination.

The colour of the sample was beautifully white, and it yielded, after calcination, perfectly white magnesia; it was quite tasteless. When thrown into dilute hydrochloric or sulphuric acid, it dissolved with lively effervescence, the solution being quite complete, and the liquid free from turbidity. The solution, neutralized by ammonia, and mixed with oxalate of ammonia, remained quite unaffected, even after the lapse of many hours. The same solution mixed with excess of carbonate of ammonia, and warmed, underwent no change. Hence, I infer, the complete absence of lime. There is a minute trace of oxide of iron, but the quantity is exceedingly small and quite unimportant.

The analysis of this compound was effected by the following means:

A weighed quantity was exposed to a full red heat for fifteen or twenty minutes, in a covered platinum crucible; the residue, found on examination to be pure magnesia, gave the quantity of that substance present. The carbonic acid was determined directly by decomposing a known weight of the preparation by excess of sulphuric acid, with the usual precautions. The water was estimated by difference—100 parts were found in this manner to contain,

Magnesia	41.6
Carbonic Acid	36.0
Water	22.4
	100.

These numbers correspond almost exactly with those obtained in the analysis of a specimen of *magnesia alba*, prepared by myself in the usual manner, more than seven years ago—100 parts gave,

Magnesia	41.2
Carbonic Acid	36.0
Water	22.8
	100.

Magnesia alba appears, in fact, to be a substance of very constant composition, although from the mode of its formation, viz., the partial decomposition of the neutral carbonate first thrown down, by the water, in the old method of preparation, we might be led to think the reverse most likely to be true.

It is well known to those engaged in Pharmacy, that there are met with in commerce two varieties of magnesia alba; the one exceedingly light and bulky, the other much denser. This difference arises solely from the state of mechanical condition; the two kinds having a chemical composition sensibly the same, as will be

seen by a comparative statement of their composition, determined as above.

	Light Magnesia Alba.	*Heavy Magnesia Alba.*
Magnesia	42.8	41.2
Carbonic Acid	36.0	36.4
Water	21.2	22.4
	100.	100.

A specimen of heavy magnesia alba prepared by myself, gave

Magnesia	41.2
Carbonic Acid	35.6
Water	23.2
	100.

It is improper therefore to apply, as is sometimes done, different names to the preparation.

The formula assigned by Berzelius to magnesia alba,

$$3\,(Mg.\,O, C\,O_2) + Mg.\,O, H\,O + 3\,H\,O.$$

does not agree with the analytical results. Reckoned to 100 parts, it gives

Magnesia	44.57
Carbonic Acid	35.77
Water	19.48
	100.

Mr. Phillips, whose experiments coincide exactly with my own, has deduced the formula

$$4\,(Mg.\,O, C\,O_2) + Mg.\,O\,2\,H\,O + 4\,H\,O.$$

which is probably the correct one.

ON THE HEAVY CARBONATE AND CALCINED MAGNESIA.

BY MR. RICHARD PHILLIPS, JUN.

My attention having been directed to the above named preparations, I was induced to make some experiments upon them, the results of which may, perhaps, be interesting to the Society.

I found that upon one atom, or 123 parts of crystallized sulphate of magnesia, being boiled with one atom, or 59 parts of sesquicarbonate of ammonia, the half atom of carbonic acid was expelled from the sesquicarbonate of ammonia, and a dense carbonate of magnesia was precipitated. This, however, when washed, dried, and calcined, lost its density.

I repeated this experiment with this difference, that I evaporated the precipitate and the sulphate of ammonia formed down to dryness, and the density of the carbonate of magnesia was increased; but when the sulphate of ammonia and carbonic acid were expelled by calcination, the magnesia in this case also lost its density. It then struck me, that as the density of the car-

bonate of magnesia had been increased by evaporating it with the salt formed to dryness, that if the residue could be heated without expelling it, the density would be retained. In order to do this by the Pharmacopœia process, one atom, or 123 parts of crystallized sulphate of magnesia, was boiled with one atom, or 144 parts of crystallized carbonate of soda, the whole was evaporated to dryness, and a carbonate of magnesia, of nearly equal density with that formed by the sesquicarbonate of ammonia, was left. The residual salts were then calcined, and afterwards allowed to remain in water until all the sulphate of soda was dissolved out. The magnesia, when washed, was found to be of the required density.

In the directions of the Pharmacopœia, the carbonate of magnesia is ordered to be calcined for two hours. I found that in half an hour, at a good bright heat, all the carbonic acid was expelled. The sulphate of magnesia of commerce sometimes contains a very small quantity of a persalt of iron; which quantity, however small, will give a reddish tinge to the calcined magnesia. This may be got rid of by dissolving the sulphate of magnesia in water, and adding lime-water until the colour of reddened litmus paper is restored; the solution must then be allowed to stand for twenty-four hours, when peroxide of iron, and any excess of lime which may have been employed, will be precipitated. The most delicate test that can be employed for the presence of iron is the ferrocyanide of potassium. I may, perhaps, also state, that I have found the sulphate of magnesia, which is sold in the shops, generally adulterated with sulphate of soda, and that if pure, 100 grains of it ought to yield 16.2 of calcined magnesia.

Craig's Court, 10th March, 1844.

Mr. Phillips, jun. in answer to a question from Mr. Fownes, said the sulphate of magnesia was decomposed by the sesquicarbonate of ammonia, and carbonate of magnesia thrown down, after boiling the solution for a few minutes.

Dr. Ure observed, that Dr. Wollaston had adopted this method of precipitating magnesia, and had described a process for detecting the presence of magnesia, which was founded upon it. With reference to the density of magnesia, he might remark, that some years ago a considerable quantity of a native carbonate of magnesia was brought to this country from India, which was much more dense than that prepared artificially. He had found from some experiments on different kinds of magnesia, that they all corresponded in composition, which was confirmatory of the statement in Mr. Fownes's paper.

The President alluded to the difficulty that was often felt in dispensing prescriptions, to determine whether the heavy or the light magnesia ought to be used. Both kinds were generally kept and

frequently used in medicine, but he believed there was no uniform rule adopted as to which should be employed when carbonate of magnesia was ordered in a prescription, and the difference in the appearance of a mixture or powder would be very marked, if prepared in one instance with the heavy, and in another with the light. Carbonate of magnesia made according to the directions of the Pharmacopœia, was, he believed, denser than the light magnesia of commerce, and yet not so dense as Howard's heavy magnesia. It was difficult to say therefore, which the College would wish to be used.

Mr. Phillips, jun. thought there was no doubt that, according to the present Pharmacopœia, carbonate of magnesia signified the light kind, and this opinion was confirmed by the fact that the introduction of a process for making heavy magnesia into the next edition of the Pharmacopœia, had been under the consideration of the College.

Mr. Fownes, in reference to the statement made at the end of Mr. Phillips's paper, that sulphate of magnesia was often adulterated with sulphate of soda, said he had heard a similar statement made by Mr. Warrington of Apothecaries' Hall, at a recent meeting of the Chemical Society.

The President drew the attention of the meeting to a specimen of copaiva, which was on the table; together with some of the wood, bark, and leaves of the tree, the Copaifera trapezefolia, from which it had been extracted. These specimens had been presented by Mr. Goodbarn, a member of the Society, who was now residing at Rio de Janeiro. In a letter sent with the specimens, Mr. Goodbarn says,

"They were collected by myself in the interior of the province of Rio de Janeiro, about four days' journey from the city, in the district of Macahé, from primeval forest. The tree was three and a half feet diameter, from which the specimen of the bark and outer and inner wood was cut, and from which the balsam exuded. It was about 100 feet high, as far as I could ascertain by pacing it from one end to the other, when down. The specimens were taken on the 5th of July last. I had it cut down on discovering it, by some natives and negroes, who accompanied me for the purpose. The tree is not prolific of balsam so far south as where this was found, although it abounds, and is valuable for its wood, which is almost imperishable. The part of the country where it is most prolific of balsam, is to the north, on the Amazon river, in the province of Para. The whole of this immense tree yielded only about double the quantity sent in the bottle (twenty ounces), whereas the trees to the north yield several gallons at the proper season."

ORIGINAL AND EXTRACTED ARTICLES.

APPENDIX TO DR. URE'S PAPER ON ALKALIMETRY, &c

As published in the last Number of the Journal.

BY THE AUTHOR.

Fig 7.

In fig. 1, p. 436, the scale of the gas-meter, *A*, should have been divided into 100 parts, instead of ten parts containing only six subdivisions each. The tube *D* may also be graduated, and may contain the due quantity of acid, for the purpose either of alkalimetry or acidimetry; and if the lower orifice be capillary, it will allow none of its contents to flow out, till the cork in the top orifice is loosened. To prevent the possibility of the loss of any gas, its lower end should be covered with liquid.

In fig. 2, p. 438, such a tube as the above, *D*, see fig. 7 on margin, may be substituted with advantage for the funnel *B*, and as that tube, *D*, may be made of such dimensions as to contain enough of acid to supersaturate the bases of the carbonates in the phial *A*, there will be no necessity for a separate vessel to hold the decomposing acid. Thus the apparatus becomes very light, convenient, and may be placed in the small scale of a fine balance; whereas the twin matrasses of Drs. Fresenius and Will, fig. 5, p. 442, as furnished by Mr. Bullock, require a very large pan or scale to stand in. I flatter myself, that the instrument, fig. 2. so mounted, will be found an acceptable present to Practical Chemists, and that it will enable them readily to examine, not only carbonates, but also manganese and bleaching substances, with great precision, by the weight of carbonic acid disengaged, on the principles explained in my Lecture.

Into the twin globe apparatus, fig. 3, p. 439, after the sulphuric acid is poured into *B*, a little water should be poured into *C*, before the carbonate is introduced into the latter. By this means the capillary throat of the tube under *A*, will not be apt to get choked with concrete salt.

March 20, 1844.

The following quotations are from the work of Drs. Fresenius and Will, as edited by Mr. Bullock for the English reader; an accurate comparison may thus be made between the relative utility of their methods and mine to the practice of ordinary operators.

"Section XXXIV. *Examination of Manganese; having at the same time regard to the Amount of Acid required for its complete Decomposition.* — "We have stated, at section 30, that it is not a matter of indifference with regard to the amount of acid employed in the production of chlorine from manganese, what are the minerals which this substance contains in admixture with the peroxide. The following modification of our method will give the most correct information on this point:

"Sulphuric acid of commerce is taken, and its amount of anhydrous acid determined, as directed at section 26, or by means of an accurate hydrometer. Of this sulphuric acid as much is weighed into *A* fig. 5 (sketch, page 16), as to give an amount of 5.47 grammes of anhydrous acid.

"The following table will show the amount which ought to be taken, according to the various degree of concentration of the acid:

Specific weight found.	Percentage amount of Anhydrous Acid found.	Amount to be used for the examination.	Specific Weight found.	Percentage amount of Anhydrous Acid found.	Amount to be used for the examination.
1.8485	81.54	6.708	1.8336	76.65	7.136
1.8480	81.13	6.742	1.8313	76.24	7.174
1.8475	80.72	6.776	1.8290	75.83	7.213
1.8467	80.31	6.811	1.8261	75.42	7.252
1.8460	79.90	6.846	1.8233	75.02	7.291
1.8449	79.49	6.881	1.8206	74.61	7.331
1.8439	79.09	6.916	1.8179	74.20	7.371
1.8424	78.68	6.951	1.8147	73.79	7.412
1.8410	78.28	6.987	1.8115	73.39	7.453
1.8393	77.84	7.027	1.8079	72.97	7.495
1.8376	77.40	7.067	1.8043	72.57	7.537
1.8356	77.02	7.101			

"As much water is then poured into *A* as will fill the flask to about one-fourth; and, lastly, from 6.5 to 7 grammes of neutral oxalate of potash, or from 5.5 to 6 grammes of neutral oxalate of soda, are added: 2.98 grammes of the (finely pounded) manganese to be examined, are then weighed—(the manganese must have been previously tested for carbonate alkaline earths: compare this section at the end) — into a small glass tube, such as used in acidimetry, and described in section 25. About the same quantity of pure pyrolusite *, in powder, is then put into another similar tube. The tube, with the manganese to be examined, is then suspended in *A* (fig. 5), as described at section 26, and the apparatus prepared, as directed at section 3. The apparatus is then placed on one scale of a balance, together with the other little tube containing the pyrosulite, and exactly weighed.

"The cork of *A* is then somewhat raised to allow the little tube with the manganese to fall into the flask. The evolution of carbonic acid commences immediately, and continues until all the manganese is decomposed. When the operation begins to get on more slowly, the flask *A* is placed in boiling water, and allowed to remain there until no more bubbles appear. The little wax-stopper is then removed † from *a*, the flask *A* taken out of the hot water, and suction applied to *d*, until the sucked air tastes no longer of carbonic acid. The apparatus, after having been allowed to cool, is wiped dry and replaced in the original scale, where the little tube with the pyrosulite still remains; weights are then substituted for the loss of carbonic acid. The num-

* "Any variety of pyrolusite will serve this purpose, provided it be free from other manganese ores. If it contains heavy spar, it may be employed directly; but should it contain alumina or lime, it must be treated first with dilute nitric acid, at a gentle heat, until all soluble parts have been dissolved; it is then washed and dried. Artificially prepared, hydrated peroxide of manganese may be substituted for pyrolusite.

† "This must of necessity be done while the flask is still standing in the hot water, or else the sulphuric acid will recede upon the apparatus being removed from the hot water."

ber of centigrammes required, divided by three, directly indicates the per centage amount of peroxide of manganese (*vide* section 32). The centigrammes substituted for the loss of carbonic acid are then removed from the balance, and the little tube with the pyrosulite is thrown into *A*. (The little wax-stopper must of course previously be replaced on *a*). If no fresh evolution of carbonic acid takes place, the manganese examined consists of pure pyrosulite, and the experiment is at an end. But should a fresh evolution of carbonic acid take place, the operation must be further conducted and brought to a close, exactly as just stated (*vide supra*). The apparatus is then replaced on the balance, with an additional weight of three grammes on the same scale. If this is sufficient to restore a perfect equilibrium, no loss of acid has taken place : the manganese, indeed, contains other matters in admixture, but only such as do not consume any acid. But if the scale with the apparatus sinks, this is a certain sign that a portion of the acid has been lost by combining with the oxides which the manganese under examination contains. The number of centigrammes required to restore the perfect equilibrium of the balance, multiplied by 0.6114, immediately indicates how much anhydrous sulphuric acid has been wasted in the decomposition of 100 parts of the manganese under examination. The same number, multiplied by 0.333, indicates the amount of acid wasted in every 100 parts of sulphuric acid employed for the decomposition of the manganese in question. The same number, multiplied by 0.5552, indicates how much anhydrous hydrochloric acid would be wasted in the decomposition of 100 parts of the manganese. The same number, multiplied by 0.333, indicates also how much acid would be wasted in every 100 parts of hydrochloric acid employed for the decomposition of the manganese.

"These figures result from the following equations:

"I. 275 (eq. of carbonic acid) : 501 (eq. of sulphuric acid) = the carbonic acid obtained *minus* (in proportion to the sulphuric acid used) : x.

$$x = \text{this carbonic acid} \times \tfrac{501}{275}, \textit{ i. e. } \times 1.822.$$

"Thus, the number obtained for x indicates the amount of sulphuric acid corresponding to the amount of carbonic acid obtained *minus*.

"II. 2.98 of manganese : 100 = x of equation I. : x.

$$x = x \text{ of I.} \times \tfrac{100}{298} \textit{ i. e. } \times 0.33557.$$

"The x of the first equation tells us how much sulphuric acid has been wasted without contributing to the decomposition of 2.98 grammes of the manganese ; the x of the second equation tells us the same for 100 parts of manganese.

"If, therefore, the amount of carbonic acid obtained *minus*, be directly multiplied by the product of the quotients of I. and II.

1.822 and 033557,

i. e. with 0.61141 (the number given above), the amount of anhydrous sulphuric acid wasted in the decomposition of every 100 parts of manganese, will immediately be found.

"III. 5.47 (the amount of sulphuric acid used):

100 = the x of I. : x.

$$x = \text{the } x \text{ of I.} \times \tfrac{100}{547}, \textit{ i. e. } \times 0.18282.$$

"Of 5.47 of sulphuric acid, the x of I. has been wasted, 100 corresponds to the x of III.

"The x of III. is, therefore, found directly by multiplying the amount of carbonic acid obtained *minus* with the product of the quotients, 1.822 and 0.18282, *i. e.* = 0.33301.

"The figures for hydrochloric acid are found in the same manner (4.967 of hydrochloric acid must be taken instead of 5.47 of the sulphuric acid)."*

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* *New Methods of Alkalimetry, and of determining the Commercial Value of Acids and Manganese.* By Drs. C. R. Fresenius and H. Will. Edited by J. Lloyd Bullock. Pp. 123—128.

ILLUSTRATIONS OF OUR PHARMACOPŒIA.

REPLY OF MR. G. M. MOWBRAY TO MR. R. PHILLIPS.

Were it not that my example may afford a hint to such of the Members and Associates of the Pharmaceutical Society, as may feel inclined to offer contributions for the advancement of Pharmacy, the reply which I have to submit, in answer to Mr. R. Phillips, would be comprised in one line, and that line would properly come under the list of *errata* in the Journal of this month; I have, in truth, been much disposed to adopt such a course, because I am fully aware how uninteresting to readers generally, and how injurious to the best interests of the Society especially, the introduction of personal controversy and recrimination must be in a Journal, whose object is, by eliciting truth, to raise the position of those who devote their time to a perusal of its contents.

A reviewer of this work, in the *Spectator*, justly remarked, that the personal discussions which usually pervade medical periodicals, have often reduced them to the lowest grade of literature. For these reasons, I should have preferred confining my answer to Mr. Phillips, as I before stated, to one line, but that I believe the conclusions to be derived from certain papers, with which my name has been associated, admit of a practical application.

I lately urged objections to certain formulæ of the Pharmacopœia Londinensis, as being vague and inaccurate; challenged the Chemistry of the authors; and endeavoured, by the examples I adduced, to show, that certain indications as to the mode of proceeding, were founded on a misconception of the properties of the persalts of iron. What followed? My objections remain unrefuted; indeed, they are indirectly admitted, by the suggestion of an imperfect remedy;* whilst an error, arising from an incorrect copy of my formula, having been furnished to the printer (and I may here remark, that I was not so fortunate as to be honoured with a revision of the proof sheets), enables those, to whom my strictures apply, to enjoy a triumphant attack, unanswerable for a month.

My reply to Mr. Phillips will be brief and not uncourteous.

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* Mr. Phillips now suggests, with a view to obviate the objections which I have urged against the formula for preparing the Ferri sesquioxydum of the Pharmacopœia Londinensis, that the addition of nitric acid to the solution of sulphate of iron, will convert it into a peroxide. The Pharmacopœia Londinensis was published in 1836; and in 1844, Mr. Phillips suggests this imperfect remedy: for I find, by adding nitric acid to such a solution, there is produced a precipitate of basic sulphate of the peroxide. Now, the directions are, "to use the solution;" it follows, then, that this precipitate will be excluded from the field of action, for it is not taken up by a further addition of nitric acid in excess. Is this—*sed motos præstat componere fluctus.*

Let him and the reader insert the figure 1 after the decimal point where the sp. gr. of the muriatic acid to be used is indicated, that is, let sp. gr. 1.116 be substituted for specific gravity 1.16, and all Mr. Phillips's objections vanish. Having done this, it remains for him to explain away, or to remedy the vagueness and inaccuracy which I have pointed out, and I trust we shall yet be favoured with Mr. Phillips's observations on the criticisms contained in a former paper.

Having thus summarily disposed of the critique on my new process, I would remind the author, that in his hurry, he has twice misquoted me. He twice states, that I "strongly recommend the process" whose details he would fain ridicule. This, I have not done, I strongly recommend the solution of a certain fixed quantity of sublimed perchloride of iron, in a definite proportion of rectified spirits of wine, in order to make the tinct. ferri sesquichloridi," and proceed to add, "for my own part, I have devised a formula," &c. &c. &c., giving the result of my labours. Thus much for the remarks of Mr. Phillips, now for the moral I am anxious to impress on future Correspondents of this Journal; if they seek to benefit their craft, they must endure one of two evils, either content themselves with mere criticism, and carefully abstain from any practical elucidation of the subject, or should they inadvertently indulge in a suggestion, let them be prepared to encounter, not a discussion of the pith of the subject, but a mere attack upon their skill as inventors.

FORMULÆ FOR IODIDE OF IRON, AND FOR PILLS OF IODIDE OF IRON.

BY MESSRS. T. AND H. SMITH, EDINBURGH.

In the first volume of the *Edinburgh and London Journal of Medical and Surgical Science*, we gave a process for the preparation of the iodide of iron, which obtained a place in the Edinburgh Pharmacopœia. Since that time we have adopted another plan which is more speedy and simple, as well as incomparably more effective in obviating the decomposition of the compound.

The iodide of iron, like most of the other compounds of this metal, which contain in an equivalent one equivalent of the negative element, is, in an eminent degree, characterized by its tendency, under the influence of air and moisture, to undergo decomposition, a soluble compound with an excess of the negative element being produced at the same time with an insoluble basic compound.

In our former method for preparing the iodide, although every

precaution that we could think of for the exclusion of the air was adopted, yet, as an open dish was used, decomposition to a considerable extent could not be avoided, however unwearied the care and attention of the operator.

According to our new plan, we make a solution of iodide of iron in a Florence flask, with six drachms of pure iron filings, two ounces and a quarter of iodine, and four and a half ounces of cold distilled water. After boiling till the liquid loses its dark colour, we filter rapidly into another clean flask, and, without delay, place the flask over the flame of a spirit lamp, or gas burner, and evaporate the liquid at a boiling heat. The ebullition may be allowed to proceed with very little attention for a considerable period, but when the liquid passes from a green shade into black, close attention becomes then necessary, as the process now approaches very near to its close.

We can obtain the compound in two states; either as a crystallized hydrate, or in an amorphous anhydrous form. To obtain it in the first form, an iron-wire or a glass-rod must be dipped into the liquid in the flask at short intervals, till, on removal and cooling, the iodide forms a dry and hard crust.

When the evaporation has reached this point, on removal from the heat, the fused iodide crystallizes on cooling. To get the iodide in the anhydrous state, the evaporation must be carried still further. The period for bringing the application of heat to a close can very readily be judged of by occasionally placing a piece of cold glass over the mouth of the flask, and removing the heat when moisture ceases to be condensed on the glass. A pure anhydrous spongy protiodide will then be found in the flask, as during the whole operation the flask is filled with a body of steam continually given off by the liquid, the atmospheric air is completely excluded to the very last. We have also proved by the test of starch-paper, that no free iodine is given off from the beginning to the end of the process.

We now remove the iodide by breaking the flask, and bruising the compound coarsely in a warm dry mortar, and enclosing it without the slightest delay in small well-corked bottles. If the process has been correctly managed, the iodide will dissolve in distilled water, giving a nearly colourless solution, or at least one having merely a slightly greenish and not a red tinge. It is not quite correct to term it *completely* soluble, as there is a minute trace of insoluble matter left, being no doubt produced by a slight decomposition of the iodide occurring during filtration, but this will be in proportion less to the same extent as the care has been greater.

It is unlikely that we should have deemed it necessary to write on this process, unless as an essential step in the formula for the

preparation of the pills of the iodide of iron, which it is the object of this paper to communicate, for the strong reason that, however correctly the iodide of iron in its usual shape may be prepared, it can scarcely be preserved from decomposition beyond a very limited period.

In the syrup, we possess a preparation of the iodide of iron with every character which can be desired in a liquid form of the medicine, and especially valuable for its elegance and little liability to change* ; but a solid preparation with these characters, we were unable to supply the Physician with in cases where he considered such a preparation suitable. To fill up such an obvious want, the formula for the pills of the iodide of iron is given, and we have not the smallest doubt, that the saccharine matter entering so largely into their composition, will be as

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* A very interesting point of speculation is involved in the changes that occur in syrup of iodide of iron, when left exposed to the air. The liquid, from being almost colourless, takes on unceasingly a deeper and deeper shade of brown, till at the end of two or three weeks it has become of a deep reddish-brown colour, but perfectly clear, and without any precipitate.

Now, by what means is the iron held in solution ? In the aqueous solution it subsides as a brown precipitate, from the absence of any acid or other body capable of holding it in solution. There can be little doubt that the same decomposition occurs in the syrup ; but the peroxide formed is kept in solution either by the sugar itself, or in all likelihood by some acid, resulting from a change in the arrangement of the elements of the sugar, perhaps, with the assistance of oxygen from the atmosphere.

The simple relation existing in the composition of cane-sugar and acetic acid, which, in fact, differ in nothing except the grouping of their elements, as they have the very same per centage composition, might suggest the question, whether this acid may not be formed, thus,

1 eq. Cane-sugar, $C_{12}\,H_9\,O_9$ = 3 eq. Acet. acid, $C_{12}\,H_9\,O_9$?

Again, by the absorption of oxygen from the air, formic and oxalic acids may be produced. The following equation will show, that by the aid of 12 eq. oxygen, 6 eq. of formic acid, and 3 eq. water, may result from 1 eq. cane-sugar :

$$\left.\begin{array}{r} \text{1 eq. Cane-sugar, } C_{12}\,H_9\,O_9 \\ + \qquad\qquad O_{12} \\ \hline C_{12}\,H_9\,O_{21} \end{array}\right\} = \left\{\begin{array}{l} \text{6 eq. Formic acid} = C_{12}\,H_6\,O_{18} \\ \text{3 eq. Water .....} = \quad H_3\,O_3 \\ \hline C^{12}\,H_9\,O_2{}^{1} \end{array}\right.$$

Again, with 18 equivalents of oxygen, 6 equivalents of oxalic acid may be formed, thus,

$$\left.\begin{array}{r} \text{1 eq. Cane-sugar, } C_{12}\,H_9\,O_9 \\ + \qquad\qquad O_{18} \\ \hline C_{12}\,H_9\,O_{27} \end{array}\right\} = \left\{\begin{array}{l} \text{6 eq. Oxalic acid} = C_{12} \quad O_{18} \\ \text{9 eq. Water.....} = \quad H_9\,O_9 \\ \hline C_{12}\,H_9\,O_{27} \end{array}\right.$$

Whether any or all of these acids are produced, or the oxide of iron be retained in solution by the mere solvent action of the unchanged sugar, can only be learned by a searching investigation, and this, in the hands of a Chemist enjoying the necessary knowledge and leisure, would undoubtedly lead to interesting results.

effectual in preventing decomposition of the iodide, as it is in the analogous preparation of the syrup.

For preparing the pills, we powder the anhydrous iodide as soon as it is taken from the flask, in an iron mortar, and then, without the delay of an instant, incorporate it correctly with twice its weight of pure refined sugar in powder, and with as little delay we beat up the mixed powders with as much honey as may be necessary to form a very firm mass, which, by following these directions, will contain one quarter of its weight of iodide of iron, so that by rolling it into four grain pills, each will contain exactly one grain.

The mass is uniform, firm, adhesive, also rolls out well; but containing so highly deliquescent a compound as the iodide of iron, it will not bear exposure. For this reason, the pills require to be kept in well-corked bottles, they have also to a certain extent another undesirable property, that of losing their round form, and falling flat. To remedy this, we would recommend that they should be put into shallow bottles, in layers alternating with some vegetable powder. Magnesia would be improper for this purpose, or as a covering for the pills, as decomposition of the iodide would undoubtedly in a certain degree be produced. As another method of remedying this fault, we might suggest that they be beat up in a hot iron mortar, and in this way less honey would be required, but in rolling them out, it would be necessary to place the mass on a dish floating on hot water, so that by the heat it would be kept in a state fit for rolling. By proceeding in this way, the pills would be much firmer and less liable to lose their shape. They dissolve completely in water, and some of them that had been kept in a pill box for weeks, although completely deliquesced, showed this character in complete perfection, a proof of the preservative power of the saccharine matter.

ON THE PREPARATION OF ETHER.

In compliance with the desire of some of our readers, we proceed to give the following details from the notes of Mr. Redwood's lecture on the above subject, delivered at the house of the Pharmaceutical Society, December, 1843:—

Ether is obtained from alcohol or spirit of wine, as the result of a decomposition, which may be effected under certain circumstances, by several bodies differing widely in their chemical characters.

The composition of alcohol is $C_2 H_3^{\overline{3}} O$, while that of ether is $C_4 H_5 O$, two atoms of alcohol therefore, $C_4 H_6 O_2$, contain the elements of one atom of ether, $C_4 H_5 O$, and one atom of water, $H O$. Thus alcohol may be considered a hydrate of ether, and

the preparation of ether consists in separating this chemically combined water.

Some Chemists consider with Mitscherlich, that the $C_4 H_5 O$ which in alcohol is combined with the elements of water, has a different constitution or atomic arrangement from the $C_4 H_5 O$ which constitutes ether in its isolated state. To the former of these isomeric compounds they apply the name oxide of ethule, and to the latter ether, so that alcohol would thus be a hydrate of oxide of ethule.

Others, again, ascribe a still different constitution to ether, and consider it a compound of olefiant gas, $C_4 H_4$, or some body isomeric with this, and water H O ; thus according to this view, ether would be a hydrate of $C_4 H_4$, and alcohol a hydrate of ether. This view of the constitution of ether was entertained previous to the adoption of the other.

Spirit of wine is a mixture of alcohol and water, and the rectification of spirit consists in the separation of the latter, which by means of caustic lime or chloride of calcium, may be completely accomplished, the alcohol being thus obtained pure. But the means employed for the rectification of spirit, will not effect the production of ether by separating the combined water which the alcohol contains.

Ether is usually obtained by mixing together oil of vitriol and spirit of wine, and submitting the mixture to distillation. This is essentially the mode of proceeding that has been adopted for obtaining it, ever since its first discovery. It was at one time considered, that oil of vitriol having a strong affinity for water, merely took the combined water of the alcohol, and set the ether free, in the same way that chloride of calcium or quick lime takes the water from spirit of wine, and sets the alcohol free, but this opinion is no longer entertained by Chemists.

The production of ether from the action of oil of vitriol on alcohol, takes place only when these are mixed in certain proportions, and at certain temperatures.

If we submit to distillation a mixture of

1 part spirit	and	1 part	oil of vitriol,	ether is produced.
1 "		$2\frac{1}{2}$ "		oil of wine "
1 "		6 "		olefiant gas "

The proportions then in which the ingredients are mixed, modify the nature of the product.

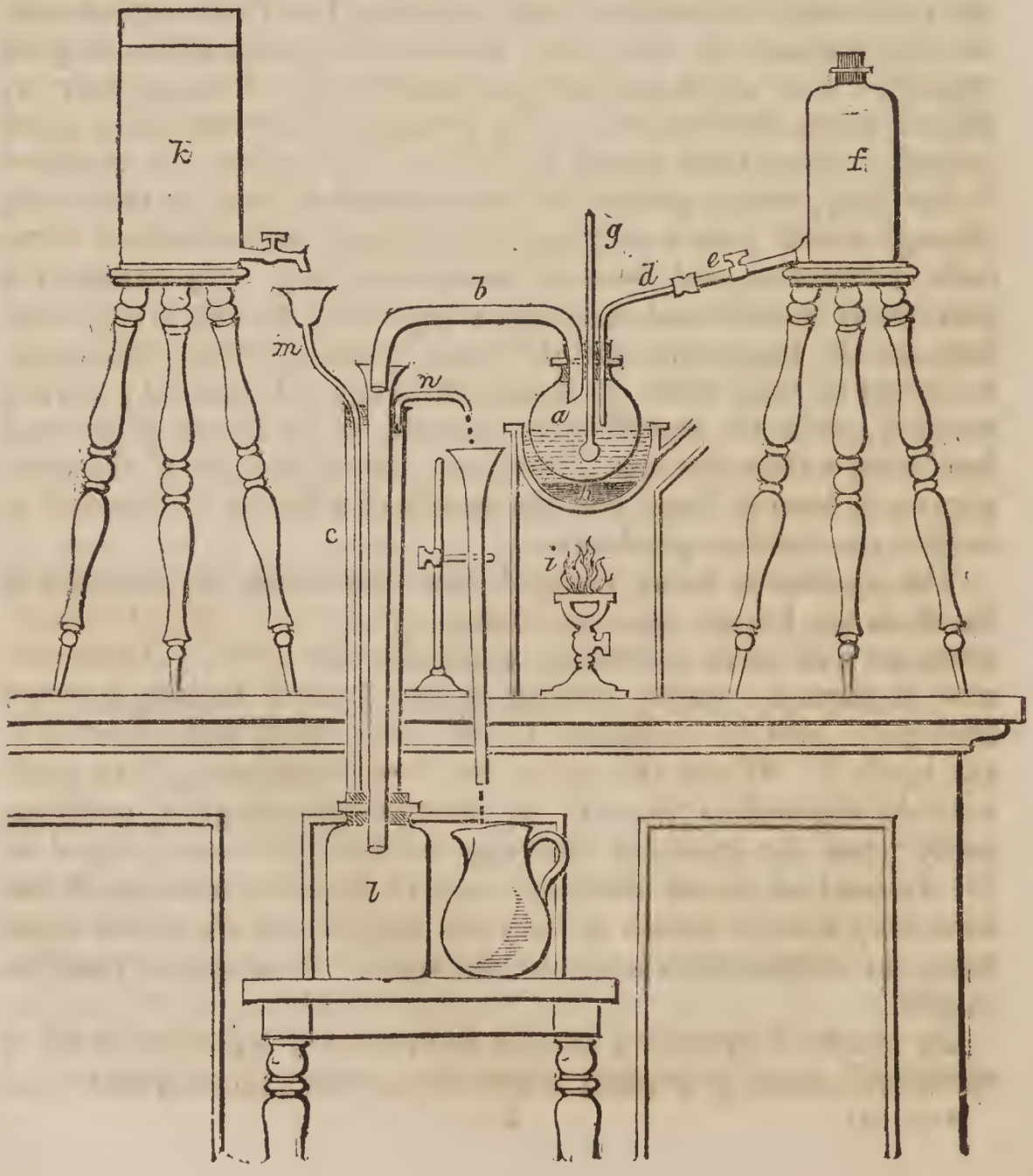
If we examine into the phenomena attending the distillation in each of these cases, it will be found that ebullition takes place at a different temperature in each. This arises from the fact that oil of vitriol requires a high temperature, 620°, to make it enter into ebullition, while spirit boils at a much lower temperature, about 180°, and a mixture of the two will boil at an

intermediate point, depending upon the proportion of the ingredients.

It is found that ether is only produced when the temperature of the boiling mixture is at a point not far from 280°. If the mixture boils at a temperature much below this, no ether will be produced, but spirit of wine will distil over. If, on the other hand, the mixture boils at a temperature much above 280°, there will be little or no ether formed, but oil of wine, or olifiant gas, or both, according to the temperature.

To produce ether abundantly and economically, the mixture of spirit of wine and oil of vitriol must be kept in such proportions that it will boil at about 280°.

The continuous process for the production of ether consists in an arrangement for preserving the boiling point of the mixture always the same. The subjoined woodcut represents the apparatus which I employ for the purpose, and which is convenient from its occupying little space.



A mixture of five fluid ounces of oil of vitriol and six fluid ounces of rectified spirit is introduced into the wide-mouthed flask *a*, the capacity of which is equal to about double this quantity. The mouth of the flask is fitted with a cork, through which passes a glass tube *b*, three-eighths of an inch in diameter, twice bent at right angles, and communicating with the refrigerator *c*. Another tube, *d*, of much smaller diameter, terminates at one end about a quarter of an inch above the surface of the liquid in the flask, and is joined at the other end by means of a caouchouc adapter to the pewter tube and stopcock *e*, by which a regulated current of rectified spirit may be allowed to run from the bottle *f* into the flask. A thermometer *g* dips into the liquid in the flask. The flask is placed in a small iron-pot *h*, fitting on to the top of a gas-furnace, *i*. The bottom of the pot is covered to the depth of about two inches with fusible metal, on which the flask rests; and above this, the upper part of the pot around the flask is filled with iron scales, obtained from a blacksmith's forge, and which are previously reduced to coarse powder. This forms a good conducting medium for the heat, so that the temperature may be regulated with great precision, by means of a rose gas-burner, placed within the furnace. The refrigerator consists of a glass cylinder, about three and a half inches in diameter and eighteen inches long, with a perforated cork accurately fitted to each end, through which passes a glass tube, about three-quarters of an inch in diameter and twenty-four inches long. By means of a small bent tube-funnel *m*, terminating at the bottom of the space between the inner tube and the outer cylinder of the refrigerator, a current of cold water is constantly supplied from the copper vessel *k*, while the heated water passes off by means of a small bent tube *n* from the top. The lower end of the tube of the refrigerator is loosely fitted into the mouth of a bottle *l*, intended to receive the distilled products.

The apparatus being charged and connected, the contents of the flask are heated until ebullition commences, when the thermometer will indicate a temperature of about 280°. Ether will now be formed; which, passing in the form of vapour, through the tube *b*, will be condensed in the refrigerator, and collected in the bottle *l*. When the ether begins to distil over, fresh spirit must be allowed to pass into the flask from the bottle *f*, continuously; and the quantity thus supplied must be exactly equal to the amount of liquid distilled over, so that the contents of the flask may always remain at the same height; while, at the same time, the temperature must be maintained as nearly as possible at 280°.

By carefully operating in this way, the same portion of oil of vitriol will serve to produce ether from a very large quantity of

spirit. The action of the oil of vitriol consists in decomposing the alcohol, and resolving it into ether and water, which distil over together, while the oil of vitriol remains in the flask.

We are indebted to the late Mr. Hennel, of Apothecaries' Hall, for some important discoveries, with reference to the reactions which take place in this process. He found that on mixing oil of vitriol and spirit of wine, in the proportions for making ether, and heating the mixture to the boiling point, nearly one-half of the oil of vitriol lost its power of precipitating baryta, or lead, or lime, from the soluble salts of these bases.

It was evident, therefore, that a great part of the sulphuric acid in the mixture was already combined with some base, and a compound formed, not easily decomposed by other bases. On separating the free sulphuric acid by lime or baryta, an acid liquor was obtained, which Mr. Hennel named sulphovinic acid. This may be saturated with lime, with lead, or baryta, and salts procured by careful evaporation, which are extremely soluble in water. These salts were called by Mr. Hennel sulphovinates. They were found, by analysis, to contain the elements of two atoms of sulphuric acid, one atom of ether, and one atom of the base employed to neutralize them.

Sulphovinic acid, therefore, consists of two atoms of sulphuric acid and one atom of ether; and it thus appears, that ether is capable of acting the part of a base, and of combining with acids to form salts. These salts, when exposed to an elevated temperature in contact with water, undergo decomposition; the sulphuric acid combines with the water, and the ether is evolved in the gaseous state.

On discovering that ether possessed powerful basic properties, a material change took place in the opinion of Chemists, with reference to the theory of etherification. Judging from analogy, it was now thought more probable that ether, instead of being a hydrate of a hydro-carbon consisting of four atoms of carbon and four atoms of hydrogen, was the oxide of a hypothetical radical consisting of four atoms of carbon and five atoms of hydrogen. This compound radical has been named ethule or ethyle; and, notwithstanding the fact, that its existence is purely hypothetical, seeing that it has never been obtained in an isolated state; while the other, olifiant gas (C_4 H_4), is obtained from alcohol by the action of oil of vitriol: yet the theory founded upon its supposed existence, so completely reconciles the composition of the ethers, both simple and compound, with the laws which are found to apply to other similar combinations, that Chemists have almost universally adopted this theory.

In accordance with these views, on mixing together oil of vitriol (hydrate of sulphuric acid) with alcohol (hydrate of oxide of

ethule), one part of the sulphuric acid is supposed to combine with the oxide of ethule, forming bisulphate of oxide of ethule; while the other part combines with the water. The bisulphate of oxide of ethule is speedily decomposed, at a temperature of 280°, giving off ether, which distils over with a portion of water; while the acid again returns to the water it had previously quitted. A fresh portion of spirit being now introduced, the same action is again repeated by the oil of vitriol, which thus separates the alcohol into ether and water; and this action might be continued to an indefinite extent, provided the proportions of acid, alcohol, and water in the flask could be kept always the same. It is, therefore, essential to the success of the operation, as a continuous process for any length of time, that ether and water should distil over in the proportions in which they exist in the spirit employed. A portion of undecomposed alcohol always passes over with the ether and water, but this is unimportant.

Ether, then, being considered as the oxide of a hypothetical radical, ethule, the compound ethers must be viewed as salts.

Thus we have,

Ethule, the radical of this series of compounds,	$C_4 H_5$.
Ether, the oxide of ethule	$C_4 H_5 O$.
Alcohol, the hydrate of oxide of ethule	$C_4 H_5 O + H O$.
Nitrous, or hyponitrous ether / Nitrite of oxide of ethule	$C_4 H_5 O + N O_3$.
Acetic ether / Acetate of oxide of ethule	$C_4 H_5 O + C_4 H_3 O^3$.
Hydrochloric ether / Chloride of ethule	$C_4 H_5 + Cl$.

There will be found the same distinction here as in other similar compounds, of oxygen and of haloid salts. Thus nitrous ether and acetic ether are combinations of an oxygen acid with an oxide, corresponding, for instance, with nitrite and acetate of potash; while hydrochloric ether, or chloride of ethule, is an haloid salt, corresponding with chloride of potassium or chloride of sodium.

Chloroform, which appears to enter into the composition of some of the compounds sold under the name of chloric ether, does not belong to this series, and in fact is not an ether.

IMPROVEMENT IN THE FORMULA FOR MAKING UNFERMENTED BREAD,

PUBLISHED IN THIS JOURNAL, VOL. I., PAGE 492.

BY MR. HENRY DEANE.

In the *Leeds Mercury*, of February 17th of the present year, is an article, by Thomas Smith, M.D., of Leeds, entitled, "An

improved and more wholesome Mode of making Bread;" which is a modification of my formula before mentioned. It will be unnecessary to recopy the whole of Dr. Smith's article in this place, as it would be a repetition of what has already appeared, but only so much as bears on the present subject of improvement.

He says,

"In the treatment of various chronic maladies, particularly dyspepsia and dyspeptic phthisis, I have frequently witnessed considerable advantage from the daily use of unfermented bread. Permit me, therefore, to make your readers acquainted with the following recipe for making it:

5 lbs of flour.
½ oz. (Apothecaries' weight) of sesquicarbonate of soda.
½ drachm of sesquicarbonate of ammonia.
4 drachms or teaspoonfuls of salt.

Mix these intimately together, and then add the following solution:—

50 oz. or 2½ pints imperial of cold water.
5 drachms of hydrochloric acid.

"This bread is easily made, requires little labour, no kneading, or time for the dough to rise. It costs a trifle more than bread made with yeast, but has the advantage of keeping longer without becoming mouldy or sour, and is entirely free from any bitter or unpleasant taste, which not unfrequently occurs in bread made according to the ordinary method.

"Its dietetic properties are, however, of the utmost importance. Bread which has undergone the panary fermentation is exceedingly liable, in weak stomachs, to turn sour and produce heartburn and flatulency, thus deranging, and in some measure destroying the perfect assimilation of nutritive aliments. But bread made by the unfermented process is free from these baneful effects. Its daily use in health prevents these symptoms, and it is capable in many instances of correcting that morbid condition of the stomach and intestines on which these symptoms depend. It is also extremely beneficial in assisting to restore the biliary, but more especially the renal secretions to a healthy condition, as well as in the treatment of various cutaneous eruptions originating in disorder of the digestive functions.

"The salt produced in this manner is not sufficient to flavour the bread, therefore an additional quantity is ordered. This, however, must in some measure be regulated by individual taste.

"I have repeatedly tried the different formulæ for making unfermented bread, and have satisfied myself from numerous experiments, that the one I now recommend will be found to answer every purpose in producing a cheap, palatable. and wholesome article of diet. And so convinced am I of its superiority over fermented bread as food for children, as well as healthy adults, that I have banished every other kind from my table."

Soon after the publication of my mode of making this kind of bread, it was discovered that the proportion of acid ordered to be employed was too much by about half a drachm; giving the bread a cold, objectionable flavour to many who had been accustomed to fermented bread. This result was entirely obviated in my own house and amongst a few personal friends and acquaintances, by reducing the quantity of acid by thirty or forty minims.

I suspect the error arose partly from a desire to make use of round numbers, for the sake of general convenience, and partly from the circumstance of the soda, from some cause, requiring more acid at one time than at another.

It would appear, therefore, that the sesquicarbonate of ammonia, employed by Dr. Smith, only a little more than saturates the excess of acid not neutralized by the soda. In this respect it answers a useful purpose; but if it be employed under the impression, that its raising effect on the bread would depend principally on its volatility, and not on the liberation of its carbonic acid, by union with the hydrochloric acid, as is undoubtedly the case in this instance, it does not fulfil the intention; and I should think its place better supplied by a little more of the fixed alkali. It may be considered necessary to have a perfectly neutral bread; and as there will always be a little uncertainty in the saturating power of the soda and acid, the employment of the volatile alkali would most effectually ensure that result. Thus far the ammonia may be an improvement; but its use must be practically inconvenient, especially in families not connected with a Druggist's shop, where small scales and weights, and fresh ammonia are always at hand.

How far the use of sesquicarbonate of ammonia may be desirable or useful for the purpose of raising this kind of bread, I have not ascertained by experiment; but judging from its effects upon fermented bread, various kinds of cakes and pastry, which I have had numerous opportunities of observing, it would probably make the bread eat dry and harsh. Much excess of soda will produce a similar effect in unfermented bread.

It appears, that the real improvement in Dr. Smith's formula is in the circumstance of his neutralizing the excess of acid, and making a larger quantity of bread with the same quantity of acid and a little more alkali, than I have directed for three pounds of flour. The bread thus made is uniformly light and spongy; it is less likely to possess any disagreeable flavour, because the chemical ingredients are more diffused, and it is, likewise, more economical.

At first sight it seems rather singular that proportions, which do not appear in practice to evolve more carbonic acid than is necessary to lighten three pounds of flour, when made into bread, should yet be quite sufficient to render five pounds uniformly light and spongy. The cause appears to be, that when the ingredients are mixed with the smaller quantity, the action is so rapid and violent, that by far the larger portion of carbonic acid escapes before the flour is converted into a mass sufficiently tenacious to retain it. On the other hand, when the larger quantity is employed, the acid is necessarily more diluted, and the alkali more diffused, whereby the action is sufficiently impeded to enable the dough to become sufficiently tenacious before the full action between them can take place. That this is the true state of the case, and that the improvement is attributable to it rather than to

the ammonia, I have satisfied myself by repeated experiments, and have been led to adopt the following formula; it is essentially the same as Dr. Smith's, omitting the ammonia; but instead, employing five pounds of flour, and increasing the quantity of soda to the saturating point of the acid ordered by him; and at page 492, vol. i., the proportions are somewhat reduced, to admit of the use of avoirdupois weight. The proportions of acid and alkali are not chemically exact, yet sufficiently so for all practical purposes, as a slight excess of either cannot be very unwholesome, and makes no appreciable difference either in taste or appearance. If the acid should at any time much predominate, the bread will be acid, and eat cold and unpleasant; if the alkali, it will have a yellow tinge. In either case the remedy is easy.

4 lbs. of flour.
½ oz. (avoirdupois weight) of bicarbonate of soda.
4⅓ fluid drachms of hydrochloric acid (sp. gr. 1.16.)
¼ oz. of common salt.
40 fluid oz. or 2 pints imperial of cold water
To be mixed as before directed.

Many persons are unsuccessful in their attempts to make this kind of bread, on enquiry it has generally appeared they had the dough too stiff, or persisted in kneading it after it was mixed, whereby the bread is made heavy. Ten ounces of fluid *must* be used to each pound of flour, eleven ounces might always be employed without disadvantage, for a deficiency incurs the necessity for too much labour in mixing, by which the carbonic acid is forced out and lost.

For the greater convenience and safety of those who may wish to adopt the plan, it is suggested that the acid be kept diluted (as under) to such a strength, that an even measure may be taken for each quantity of soda employed, and that the soda be kept weighed in packets ready for use.

Acid twenty-six measures, water forty-six measures, forming, when mixed, seventy-two measures of diluted acid. Of this diluted acid, use one and a half fluid ounce to each half ounce of soda, &c.

COCHINEAL AND SALT OF TARTAR IN HOOPING-COUGH.

We have received the following from a Correspondent:—

If not too medical a subject, I would hazard an opinion on the alleged curative effects of cochineal in hooping-cough, particularly after the letter of Dr. Allnatt in your last number.

Every Druggist knows well what it is "carefully to prepare the prescription," ten grains of cochineal, and one scruple of salt of tartar to be dissolved in a quarter of a pint of boiling water, and sweetened with a little loaf sugar. A teaspoonful to be taken three or four times a day. Multitudes of children take this remedy, and many, I believe, are relieved by it. But it has always appeared to me, that the alkali is the efficient remedy, and in support of this opinion, I have known many private persons use the salt of tartar alone, and I have also seen it repeatedly prescribed by medical men, and certainly with equal benefit as when united with the cochineal. The alkali appears to soften, and to detach more easily from the surfaces the viscid phlegm, and this induces freer expectoration; knowing, as all must do, the capricious nature of hooping-cough and its resistance to medical treatment, I think we require more proofs of the curative power of cochineal than we at present possess, and that conium will be found a far superior antispasmodic to coccus, which I verily believe is of little service, but as affording a pretty colour to unpalateable physic.

ON THE CONSTITUTION OF SOME OF THE SALTS OF CITRIC ACID.

BY W. HELDT.

The author has followed Liebig's view, that the formulæ of citric acid are as follows:

Anhydrous Acid C_{12} H_5 O_{11}.

Acid dried at 212° Fahr. C_{12} H_5 O_{11}+3 H O.

Acid crystallized by cooling C_{12} H_5 O_{11}+4 Aq. (according to Berzelius); or C_{12} H_5 O_{11}, 3 H O+Aq. according to which view, citric acid is a tribasic acid.

Crystallized Acid, obtained by spontaneous evaporation, C_{12} H_5 O_{11} 3 HO+2 Aq.

Tribasic Citrate of Potash C_{12} H_7 O_{13} 3 KO.

Bibasic Citrate of Potash C_{12} H_6 O_{12} 2 KO.

Unibasic Citrate of Potash C_{12} H_{11} O_{17} KO.

Tribasic Citrate of Soda C_{12} H_{16} O_{22} 3 Na O.

Bibasic Citrate of Soda C_{12} H_8 O_{14} 2 Na O.

Unibasic Citrate of Soda C_{12} H_9 O_{15} Na O.

Citrate of Potash and Soda C_{24} H_{23} O_{35} 3 Na O, 3 KO.

At 392° Fahr. the salt lost 17.16—17.4 per cent. of water, and consisted then of C_{24} H_{10} O_{22} 3 Na O, 3 KO.

Citrate of Ammonia C_{12} H_{14} N_4 O_4.

Citrate of Potash and Ammonia C_{24} H_{19} N_4 O_{25}, 3 KO.

Tribasic Citrate of Lime C_{12} H_9 O_{15}, 3 Ca O.

Bibasic Citrate of Lime C_{12} H_8 O_{14}, 2 Ca. O.—Extract from the *Pharmaceutisches Central Blatt*, No. 52, November 18, 1843.

COPAIVA SUGAR-PLUMS.

(*The formula of M. Fortin*).

TAKE of

Balsam of Copaiva, 460 grains.
Calcined Magnesia, 18 grains.

Intimately mix these ingredients, and in about twenty-four hours the mass may be divided into seventy-two parts, which are to be rolled out between the fingers. These are to be covered with gum and sugar, prepared in the following manner :

1st. A solution of gum arabic, containing a third of its weight of gum.

2d. White sugar, in powder.

Put the copaiva pills into a tinned-basin, of an hemispherical form; pour in a little of the solution of gum, to moisten them ; then add some of the powdered sugar, and turn the basin so as to get the pills covered all over ; repeat this operation three times, and afterwards place the sugar-plums on a horsehair sieve, in a stove heated to 77° Fahr. The temperature of the basin, during the covering of the pills, should not be above 60° Fahr.—*Journal de Pharmacie.*

CHEMICAL ANALYSIS OF GUANO.

BY T. OELLACHER.
Apothecary at Insbruck.

THE striking effect produced by the American bird-dung or guano, as an article of manure, has induced the *Imperial Agricultural Association* of the Tyrol and Vorarlberg to procure a sample from Trieste, to enable the society here, as also its branch establishments, to make comparative experiments in manuring with this substance: favourable opportunity offering itself in the great variety of soil and climate observed in the different valleys of our mountainous country. As it was important to know the composition of this guano, in order to be able to account for the success or failure of the experiments, I undertook the following analysis, especially as the results of the valuable investigations of other Chemists, with which I was acquainted, led me to expect a difference in the composition of the various specimens of guano :

1. The guano which I analyzed is of a light yellow-brown colour, knobby, rather dry, friable, smells powerfully of urine, has a saline taste, and is here and there intermixed with light laminated crystalline portions, which not unfrequently form separate white roundish grains, varying from the size of a pea to that of a pigeon's egg. Sometimes the remains of feathers are found in it. The guano used for this analysis was taken from a quantity of ten pounds in weight, which was reduced to an uniform powder, and passed through a sieve, in order to allow of an estimation of its composition on a large scale.

2. Guano, when ignited, becomes first black, then emits smoke, with an odour of burnt animal matter, and leaves a grayish-white ash, in which are found phosphoric acid, sulphuric acid, carbonic acid, hydrochloric acid, potash, soda, lime, magnesia, and sand.

3. If a glass-rod, dipped into muriatic acid, be held over dry guano or over an aqueous extract, strong fumes are developed ; a solution, prepared cold and filtered, has a slightly alkaline reaction. If a vessel, containing dry guano or an aqueous solution, prepared at an ordinary temperature, be covered with reddened litmus paper or yellow turmeric paper, and a glass-plate be placed over it, the former will in a short time be rendered blue, the

latter will change to a dark red colour. Guano, therefore, contains a volatile salt of ammonia, which reacts as an alkali.

4. Guano was boiled with water : both the solution and the well-digested insoluble residue generated, when heated with caustic potash, ammoniacal gas.

5. The aqueous solution gave a brown flocculent precipitate with muriatic acid, nitric acid, and sulphuric acid ; which, on being dried, yielded a dark brown substance with a vitreous fracture, which was very combustible, and burnt away like tinder. With a large quantity of water it is soluble, and has a yellow colour, and is precipitated from its solution in the form of brown flocculi by muriatic acid, also by acetate of lead and proto-chloride of tin. The filtered solution is now a clear fluid, in which a solution of soap produces no turbidity. Spirit does not dissolve this substance at the ordinary temperature, and when heated it does so with difficulty, the solution becoming slightly yellow ; potash and ammonia readily dissolve it, producing a solution of a brownish-yellow colour, from which the mineral acids again precipitate it. This substance is, therefore, humic acid or ulmine.

6. The aqueous solution of guano, freed of its humic acid by pure nitric acid, gave,

a. With nitrate of silver, a white, caseous precipitate of chloride of silver, which became black on exposure to the light, was soluble in ammonia, and insoluble in nitric acid.

b. With nitrate of barytes, a white precipitate of sulphate of barytes, insoluble in acids.

c. With ammonia, a white, crystalline, granular precipitate of basic phosphate of ammonia and magnesia. The same precipitate is more copiously produced in several hours where no ammonia is used, if sulphate of magnesia be added. The aqueous solution of guano, therefore, contains both phosphate of magnesia and phosphate of ammonia ; consequently, a double salt of phosphate of ammonia and magnesia.

d. With oxalate of potash, no precipitate ensued. Guano, therefore, contains no soluble salts of lime. Chloride of iron, ferrocyanide of potassium, and hydrosulphuret of ammonia produced neither discoloration nor a precipitate.

e. Mixed with alcohol, so that the solution was not rendered turbid, it yielded, on addition of tartaric acid, in a short time bitartrate of potash.

f. Supersaturated with sulphuric acid, a few grains of common salt were added, and as much sulphate of indigo in solution as was necessary to render the fluid of a green colour, it did not change its colour after boiling for some time. Guano, therefore, contains no nitrates.

g. When all the phosphoric acid is precipitated from the solution by chloride of magnesium and ammonia, chloride of calcium produces a precipitate of oxalate of lime. Guano, therefore, contains a soluble oxalate.

7. A portion of the aqueous solution (sect. 4) was evaporated and left a brown residue, which on being heated, emitted copious fumes, swelled up with the development of an odour of animal matter, and then carbonized, leaving a white fusible substance, soluble in water ; the solution had not an alkaline reaction, and yielded.

a. Diluted with much water, a white flocculent precipitate with chloride of barium and calcium, perfectly soluble in muriatic acid, without brown discoloration. The solution, therefore, contained phosphoric acid without a trace of sulphuric acid and carbonic acid.

b. Rendered first acid by chemically pure nitric acid, nitrate of silver produced a slight precipitate of chloride of silver ; the solution, therefore, contained a little chlorine. As we were rather astonished to find that the phosphoric acid on the application of heat drove off the sulphuric acid, but not the muriatic acid, the same experiments were repeated twice with different portions of guano, but always with the same result.

c. With ammonia and phosphate of soda, basic phosphate of magnesia was precipitated.

d. With alcohol, and shaken with tartaric acid, bitartrate of potash separated.

8. The residue insoluble in water (in sect. 4) effervesces on the addition of acids. Closer examination proved it to consist of phosphoric acid, oxalic acid, carbonic acid, nitric acid, ammonia, lime, magnesia, and sand.

9. Pure alcohol extracted from the guano, on application of heat, a yellow wax-like substance, and some muriate of ammonia. Urea could not be demonstrated to exist in it.

10. The most important point was to determine the quantity of ammonia, both the absolute quantity in the guano in general, and the relative proportions of that part of the manure soluble in water, and of the portion insoluble in that fluid, or but slighly soluble. As a solution of potash extracted more than 69 per cent. of ammonia from the guano examined, it appeared the most proper reagent for the removal of all the ammonia; but two experiments in which this was attempted by distillation, failed, in consequence of effervescence, which is unavoidable. The desired result was however obtained with satisfactory certainty, by driving off the greater part of the ammonia by lime first (a process in which no effervescence is to be dreaded) and then expelling the rest in a second distillation with potash, which will now no longer produce effervescence, and frustrate the experiment. To determine the quantity of ammonia in general, 100 grammes of guano were mixed with ten times the quantity of water, finely levigated and placed in a tubulated retort holding six quarts; to this was added milk of lime, prepared from 200 grammes of quick lime and the same quantity of water, and the whole was well mixed together; with this large quantity of water, no trace of an odour of ammonia could be detected, whilst the solution was cold, and there was no possibility of an escape of gas. A receiver surrounded with ice was hermetically fitted to the neck of the retort, and filled with dilute muriatic acid. Through the bulb of the receiver passed a bent glass tube, whose large arms reached to the bottom of a vessel partially filled with dilute muriatic acid. The distillation was conducted carefully during two days, until very little fluid was left in the retort, the apparatus then remained undisturbed for a few days, and hydrogen gas was lastly passed through it to absorb the atmosphere of ammonia completely. A dilute solution of caustic potash was now put into the retort, and the distillation was continued until the vessel was *nearly* (not completely) dry, and hydrogen gas was again passed through the apparatus. On careful evaporation of the result of the distillation, and of the acid fluid in the other vessel, 37.68 grammes of pure dry muriate of ammonia were obtained, which volatilized on application of heat without the slightest brown discolouration; guano, therefore, contains 12.07 per cent of ammonia. The residue in the retort becomes black on being exposed to heat, and the alkaline solution yielded with acids uric acid, the ammonia obtained in this distillation was, therefore, a pure educt.

11. 24,000 grammes of finely pulverized guano were boiled with water, and well-washed. The result obtained by filtration weighed 817.7 grammes, the insoluble residue dried in a water-bath, weighed 11.37 grammes, or 47.38 per cent., therefore

52.62 per cent. of constituents soluble in water.
47.38 per cent. of constituents insoluble in water, form

100.000

12. Of the 11.37 grammes of insoluble residue (of sect. 11) 5,000 grammes were used to determine the quantity of ammonia in a small apparatus after the plan mentioned (sect. 10); 0.814 grammes of dry muriate of ammonia were obtained, or 0.261 grammes of ammonia; according to this experiment, therefore, 0.594 grammes of ammonia were contained in those 11.37 grammes of residue obtained from 24 grammes of

guano, or 2.46 per cent. of ammonia in 100 of guano in the residue insoluble in water. As according to section 10, the whole quantity of ammonia contained in guano amounts to 12.07 per cent. we have

9.61 per cent. of ammonia in the portion of constituents *soluble* in water.
2.46 per cent, in the constituents *insoluble* in water.

12.07 per cent. *total quantity* of ammonia contained in guano.

13. Those 817.7 grammes of the aqueous extract obtained by filtration (of sect. 11) were divided into several portions, and submitted to the following experiments :—

48.000 grammes of it were mixed with a little sulphuric acid to decompose the chloride of sodium, and evaporated, the residue was carbonized, heated to a red heat, mixed with carbonate of ammonia, and again heated to convert the acid salt into a neutral salt. The weight of the fusible residue in two experiments amounted to 0.133 grammes, that is to say, 2.266 grammes of unconsumed salts are in this manner obtained from 24 grammes of guano, a result=9.44 per cent of incombustible salts.

14. 48.000 grammes of the same residue obtained by filtration, were acidulated with muriatic acid, and the sulphuric acid was precipitated by chloride of barium. The washed and heated sulphate of barytes weighed 0.175 grammes, *i. e.* 2.982 grammes to 24 grammes of guano, which contain 1.025 grammes, or 4.60 per cent of sulphuric acid.

15. 48.000 grammes of the same extract (sect. 11) were mixed with an equivalent by volume of alcohol, and left to stand for several hours ; not the slightest separation of any sulphate took place. To the clear fluid tartaric acid was added ; the bitartrate of potash which separated in 24 hours, was washed with spirit and carbonized ; the carbonate of potash extracted by water was saturated with muriatic acid and slightly heated ; in this manner 0.048 grammes of chloride of potassium were obtained, or 0.818 to 24 grammes of guano, which give (as the potash is contained in the form of a sulphate in guano) 0.957 grammes, o 14.00 per cent. of sulphate of potash.

16. 48.000 grammes of the same extract (section 11) were mixed with ammonia, during which process basic phosphate of ammonia and magnesia was separated, which, on being heated, weighed 0.013 grammes ; 24 grammes therefore of guano correspond with 0.221 grammes, or 0.92 per cent. of phosphate of magnesia.

17. 96 grammes of the same residue (of sect. 11) were mixed with chloride of magnesium and with a sufficient quantity of muriate of ammonia (to prevent the magnesia from being precipitated from the chloride of magnesium) and with ammonia, all the phosphoric acid of the constituents of the guano soluble in water with the phosphate of magnesia (of sect. 16) was precipitated as basic phosphate of magnesia and ammonia. The well-washed precipitate yielded. on exposure to heat, 0.191 grammes, or to 24 grammes of guano 1.627 grammes, or 6.78 per cent. of phosphate of magnesia.

18. 48.000 grammes of the filtered residue (of sect. 11) were freed in the manner described (in sect. 17) of all the phosphoric acid, and the ammonia-potash solution, which remained after the removal of the basic double salt by filter, was precipitated by chloride of calcium, the deposit was oxalate of lime. This was heated with the customary caution with carbonate of ammonia, and gave 0.177 grammes of carbonate of lime ; 24 grammes of guano therefore yield 3.016 grammes, or 12.57 per cent. of carbonate of lime, which reduced to oxalate of lime, give 9.00 per cent. of oxalic acid as the quantity of this acid contained in guano.

19. To determine the quantity of humic acid shown to exist in (sect. 5) guano, 96 grains of the above mentioned residue (sect. 11) were supersaturated with muriatic acid, and the humic acid which separated was washed

with spirit of wine; when dried in a water-bath it weighed 0.026 grammes, a result which gives 0.221 grammes, or 0.92 per cent. of humic acid to 24 grammes of guano.

20. To determine the quantity of chlorine, 1.010 grammes of finely pulverized guano were boiled with water, filtered, and the humic acid was precipitated from the solution by nitric acid, the precipitate was collected on a filter, and the muriatic acid was precipitated from the strongly acid solution by nitrate of silver. The melted chloride of silver weighed 0.071 grammes = 0.0175 grammes, or 1.73 per cent. of chlorine.

21. Of those 11.37 grammes of residue boiled with water (sect. 11) 2.000 grammes were boiled with nitric acid diluted with 50 times its weight of water, and effervescence ensued. The insoluble residue yields, after exposure to heat, 0.071 grammes of sand insoluble in muriatic acid; of this substance, 0.404 grammes, or 1.68 per cent. are contained in 24 grammes of guano.

22. The nitric acid solution (sect. 21) was supersaturated with ammonia; a voluminous white precipitate resulted, which was redissolved by acetic acid, leaving a white cloudy precipitate of oxalate of lime, giving after exposure to heat 4.040 grammes of carbonate of lime, equivalent to 0.055 grammes of oxalate of lime; 24 grammes of guano, therefore, contain 0.313 grammes, or 1.30 per cent of oxalate of lime.

23. From the filtered solution, phosphate of lead was precipitated by neutral acetate of lead, and a quantity weighing on exposure to heat 2.460 grammes was obtained; 24 grammes of guano therefore, yield 139.85 grammes of phosphate of lead, containing 3.390 grammes, or 14.13 per cent, of phosphoric acid.

24. The solution remaining after the phosphate of lead had been removed by filtration, was diluted with a large quantity of water to prevent the sulphate of lime from being precipitated, and the superfluous quantity of lead was now removed by sulphuric acid; the filtered solution when freed from the lead, was rendered ammoniacal, and the lime was precipitated by oxalate of ammonia; 0.740 grammes of heated or desiccated carbonate of lime were thus obtained, containing 0.417 grammes of lime, which would indicate 24 grammes of guano to contain 2.371 grammes, or 9.88 per cent. of lime.

25. The solution from which the oxalate of lime was separated by filtration was evaporated, and the residue was exposed to heat, it weighed 0.210 grammes, was completely and readily soluble in water, and consisted of pure sulphate of magnesia; as 0.0714 grammes of magnesia are contained in this quantity, we may reckon for 24 grammes of guano, 0.406 grammes, or 1.69 per cent. of magnesia.

26. 2.000 grammes of the 11.37 grammes of residue extracted by water (sect. 11) were treated with a boiling solution of caustic potash, and the filtered solution was supersaturated with muriatic acid; the brown crystallized hydrate of uric acid, which separated, was dried in a water-bath, and weighed 0.541 grammes, giving for 24 grammes of guano 3.076 grammes, or 12.82 per cent of crystalline hydrated uric acid, or 10.58 per cent. of anhydrous uric acid.

27. 3.460 grammes of finely pulverized guano were boiled with pure alcohol, the solution assumed a yellow colour. The filtered alcoholic solution was mixed with water and evaporated; the water held muriate of ammonia in solution, and an insoluble substance resembling wax, was separated, which, washed with boiling water and dried, amounted to 0.026 grammes, or 0.75 per cent. By heat it was totally consumed, leaving no residue.

28. 9.000 grammes of guano lost in eight hours 0.460 grammes, or 5.11 per cent. in weight at a temperature of 122° Fahr. This loss consists of hygroscopic water and carbonate of ammonia.

[*To be continued in our next.*]

NOTICES OF BOOKS.

A Manual of Medical Jurisprudence. By Alfred S. Taylor, *Lecturer on Medical Jurisprudence and Chemistry in Guy's Hospital.* Small 8vo, pp. 679. *John Churchill, Princes Street, Soho.*

We had intended to give a short notice of this very excellent work this month, but want of space obliges us to defer it.

We are also obliged, for the same reason, to defer our notices of The United States Dispensatory; Dr. Neligan's Treatise on Medicines and their Uses; and Mr. Noad's Lectures on Electricity.

BOOKS RECEIVED.

Geology, Introductory, Descriptive, and Practical. By David Thomas Ansted, M.A., F.R.S., F.G.S. Part I.

A History of British Fossils, Mammalia, and Birds. By Richard Owen, F.R.S., F.G.S., &c. Part I.

An Essay on the Food of Plants, *to which a prize was awarded by the Royal Agricultural Society of England, in December,* 1842. By George Fownes, Ph. D.

We have also received the first number of the new series of THE LANCET, which was announced on the cover of our last number. This journal has been greatly enlarged in size, and adapted for circulation through the post, while at the same time the price has been reduced from 8*d.* to 6*d.* for the unstamped, and 7*d.* the stamped numbers. Among the new features in this series, the publication of Professor Liebig's Lectures on Organic Chemistry, together with much other matter of a similar character, will give it increased interest to many of our readers.

Erratum.—Mr. Scanlan has informed us that the manufactory at which he saw nitrous ether made from the residual liquor after making fulminating mercury, was near *London,* not near *Birmingham.* The error in our report arose from the fact, that Mr. Scanlan had undertaken to send us a correct copy of his remarks, which however he omitted to do, and at the last moment we were obliged to insert them from memory. Mr. Scanlan told us he would write us a letter to correct the error, but this not having arrived, we insert the above.

TO CORRESPONDENTS.

Amator Scientiæ.—(1.) "What is meant by the refraction in the sales of saltpetre: *e. g.* 40 bags of saltpetre refracting 7½ at 25*s.*?" [The loss which rough saltpetre sustains in refining is technically termed the *refraction.* —(2.) As a general rule, mixtures containing deposits should not be filtered or strained, unless ordered to be so; there may be exceptions in which common sense must guide the dispenser.—(3.) We are unacquainted with hydrated

persulphuret of iron. Sesquisulphuret of iron is prepared in the moist way by adding hydrosulphuret of ammonia to a sesquisalt of iron.—(4.) Directions for preparing hydrated sesquioxide of iron are given in the Edinburgh Pharmacopœia, where the compound is called *ferrugo*. Tincture of sesquichloride of iron of the shops contains some protochloride, and hence yields a portion of protoxide. Ammonia must be used to precipitate the hydrated sesquioxide from a sesquisalt of iron. The sesquioxide retains in combination with it some ammonia; but this does not prove injurious to its therapeutical use. If potash or soda be substituted for ammonia, we obtain, unless the alkali be in excess, a subsalt, instead of the hydrated oxide of iron; and if we use excess of potash or soda, a portion of the alkali combines with the oxide. Oxide, which has been precipitated by potash, is not equally efficacious, as an antidote for arsenic, to that obtained by ammonia. (See Dr. Pereira's *Materia Medica*, vol. i., p. 840).—(5.) We cannot undertake to recommend works on the Practice of Physic.

"Amator Scientiæ."—(1). For Liq. Morph. Acetat. [see vol. i, p. 170. —(2). The first volume of the *Annals of Chemistry and Practical Pharmacy* was completed. The publication has been given up.—(3). Neither Dumas's nor Berzelius's works have been translated into English.—(4). The acetate of iron of the Dublin Pharmacopœia, made by dissolving sesquioxide of iron in acetic acid, is of a deep red colour, but the whole of the oxide ordered is not dissolved during the process.—(5). We have generally found Beaufoy's Acetic Acid to correspond with the Acidum Aceticum of the Pharmacopœia, it should therefore be diluted in the proportions of fifteen parts to eighty-five of water, to reduce it to the strength of distilled vinegar.

G. A. T.—(1). Although Chemists are called upon to supply medicine on Sunday, we are not aware that they are expected to cross question their customers as to the purpose to which each individual article is to be applied. —(2). The Sydenham Society has published its first work, entitled *The Epidemics of the Middle Ages*. Dr. R. Bennett is the Secretary.

"A Young Chemist."—*Parnell's Chemical Analysis*, with the aid of *much practical experience*, might possibly enable our Correspondent to effect the object desired.

"Elephant."—We do not profess to give medical advice.

"Studiosus."—(1). Cochlearia majora or ampliora, means *tablespoonfuls*. —(2). Liebig's Lectures on Organic Chemistry are in course of publication in the new series of the *Lancet*, which has just commenced.

"An Associate."—The best solvents for Indian rubber are, coal-naphtha (commonly termed *coal-oil*), and oil of turpentine. A mixture of the two is generally used.

Mr. Blakeley, in answer to G. S. of Devizes, recommends as a substitute for glass in hot-bed frames, linen well soaked by brushing it twice over with boiled oil.

"Ignotus" inquires where he may obtain chemical apparatus, such as Berlin capsules, German glass vessels, air pumps, &c. [It would be invidious to recommend one manufacturer to the exclusion of others, we must therefore refer our Correspondent to the advertisements which appear occasionally on the cover.]

"A Subscriber."—We think it probable that the marking ink which is used without mordant (see vol. ii, p. 535), might be used with metal types, if thickened with compound tragacanth powder.

G. J. A. inquires whether the Council has sanctioned the establishment of a branch School of Pharmacy at Liverpool; and whether, in the event of this taking place, a fee would be required from Members and Associates for the lectures. [The Council has not received any official report for confirmation from Liverpool on this subject. It is usual in provincial schools as well as in London, for Members and Associates to pay a small fee for attending the lectures, but this fee is considerably less than that which is charged to strangers. See also vol. iii, p. 286.]

I. H. A.—See vol. ii., p. 481. The Major Examination is similar to the Minor, but more severe.

E. S. G. (Southampton), C. S. (Islington), and "AMICUS," are referred to our leading article of this month.

S. I. S. (Dublin). — (1). Of the two processes mentioned, we recommend that of the Pharmacopœia.—(2.) The process for removing the stains of marking ink has been repeatedly given in this Journal. See vol. i., page 314. —(3.) See the Pharmacopœia.

"AN ASSOCIATE" (Margate.) — The only tincture of rhubarb in the Pharmacopœia is the Tinct. Rhei. Comp., which we presume is intended to be used in the prescription sent.

"TYRO" thinks it would be a benefit to many readers if some of our botanical Correspondents would give explicit instructions for preparing a hortus siccus.

"CENSORIUS" wishes to know how to pronounce the word *Scheele.* [We have generally heard it pronounced Sheele].

"AN ASSOCIATE" (Cornwall).—(1.) We are unacquainted with the formula for Hard's Farinaceous Food, not being in his confidence. (*See* Dr. Pereira's work on *Diet*).—(2.)Soap is incompatible with sulphate of iron or sulphate of zinc in prescriptions.

R. E. (Rochdale). — We intend to make use of the communication when we have a page to spare.

"INQUISITOR" (Denbigh). — An Apprentice cannot become a *Member* of the Society, but may subscribe as an *Apprentice.* Application should be made to the Secretary, Mr. SMITH, 17, Bloomsbury Square.

"CHEMICUS" should also write to the Secretary.

"AN ASSOCIATE" (Maidstone). — A certificate from a competent schoolmaster would be received from an Apprentice in the country, desiring to become a subscriber to the PHARMACEUTICAL SOCIETY.

"TAMARINDUS."—See Notice on the cover.

P. L. T.—The oil of turpentine sold under the name of Camphine, would become partially resinified, and rendered unfit for burning, if kept long with access of air.

T. ARNALL wishes to direct attention to the impure state of some of the iodide of potassium now met with in commerce, arising he supposes from the present high price of iodine In one specimen he found ℥ij of the salt to contain only 82 grains of iodide of potassium, the remainder consisting of water and carbonate of potash.

Two Correspondents wish for formulæ for the preparation of potassio-iodide of iron, iodide of quinine, and iodide of iron and quinine.

Œq. and H.—The following is the formula for *Tinctura Nucis Vomicæ* according to the Dublin Pharmacopœia:—Nux vomica, rasped, ℥ij, rectified spirit, ℥viij, macerate for seven days and filter. Dose, from ten to thirty minims.

"AN ASSOCIATE" (Bromsgrove).—(1). Chloride of silver may be obtained by adding hydrochloric acid to solution of nitrate of silver. It is soluble in liquor ammoniæ.—(2). To obtain oxide of copper, add liquor potassæ in excess to solution of sulphate of copper, and subsequently igniting the precipitate. —(3). Depilatory, for removing superfluous hairs from the skin, is generally made of quick lime and orpiment. The use of applications of this kind is attended with considerable risk, and the result is seldom satisfactory. — (4). Certainly.

"CRANIUM."—See the last answer.

A.P.S. (Fakenham). — (1). We have nothing further to communicate on the subject. (2.) See the Notice on the cover.

G. S. B. H. R.—(1). Castor oil cannot be subjected to distillation without decomposition.—(2). *Noad's Lectures on Electricity.*

W. W. MORRIS.—The powder on the filtering paper consists of the colouring matter of the rose; the crystals are sulphate of magnesia.

¶.—If the powder be Pulv. Antimonii Comp., it will be almost entirely insoluble in water, if Antim. Potassio Tart., it will be soluble, and the solution will afford a red precipitate with sulphuretted hydrogen.

T. R.—We know of no means of preventing the deposit which takes place in some kinds of castor oil, in cold weather. When formed, it may be separated by filtration, but this is a troublesome process. The American oil is said to congeal at a higher temperature than that brought from the East Indies.

X. Y. Z. wishes for a formula for Printers' Ink.

"Tyro," (Barnsley), has sent us some calomel which he suspects is not genuine, and requests our opinion. We do not profess to undertake the examination of any specimens that may be sent us, as this would occupy more time than we can devote to it, but comply with our Correspondent's desire in this instance. The calomel appears to be genuine. It contains a minute trace of iron, derived most probably from the vessels employed in its manufacture, but this would not interfere with its action.

Writing Ink.—In answer to the inquiry of "Atramentum" in our last number, a Correspondent, Mr. Steward refers to the formula for Writing Ink in *Ure's Chemical Dictionary*, as follows.—"Take 8 ounces of Aleppo galls in coarse powder, 4 ounces of logwood in chips, 4 ounces of sulphate of iron, 3 ounces of gum arabic in powder, 1 ounce of sulphate of copper, and 1 ounce of sugar candy. Boil the galls and logwood together in twelve pounds of water for one hour, or till half the liquid has evaporated. Strain the decoction through a hair sieve or linen cloth, and then add the other ingredients, stir the mixture till the whole is dissolved, more especially the gum; after which leave it to subside for twenty-four hours. Then decant the ink, and preserve it in bottles of glass or stone-ware, well corked."

Mr. Woodward has sent us a recipe for ink, with some of which he states his letter is written. Judging from the specimen, we cannot recommend it in preference to the above. Mr. Woodward wishes for a good recipe for red ink.

"An English Assistant in Paris."—(1). For Cheltenham Salts, see vol. iii, page 190.—(2). Sal volatile, when made according to the Pharmacopœia, acquires a brown colour, when kept for some time. We know of no other way of obviating this than by omitting the cloves.

"A Member."—Formulæ for the preparation of *Artificial Gems*, are given in the *Traité de Chimie appliquée aux Arts of Dumas*, vol. ii.; *Aikin's Dictionary of Chemistry*, vol. i., article *Glass Coloured*; *Lardner's Cyclopædia*, article *Porcelain and Glass*, and *Gray's Operative Chemist*.

"Studiosus" is not eligible to pass the minor examination, being already an Associate, but Associates are at liberty to pass the major examination.

X. Y. Z.—Mr. Churchill regulates the advertisements. The scale of charges has been published.

"Aliquis, F.P.S." complains that his letter was not answered last month. We accidentally mislaid one communication containing a specimen of a salt which was found to be nitrate of mercury. Three letters were not answered, because we thought the authors could scarcely be serious in asking the questions. We are not aware to which communication Aliquis alludes.

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. XI.—MAY 1st, 1844.

RESTRICTIONS IN THE MEDICAL PROFESSION.

The nature and stringency of the restrictions imposed on unqualified persons must of necessity vary with the advancement of education and science in the Medical Profession: the greater the difference in attainment between the educated and the uneducated, the more justly may the former claim, on public grounds, to be protected against the encroachments of the latter. It is, in fact, for the benefit of the public that restrictions are imposed; for although their tendency may, in some degree, resemble that of a monopoly in favour of the Profession, yet it must be remembered, that unless some adequate advantages be granted to qualified persons, the inducement to qualify will not exist, and consequently the public must suffer.

But when the stringency of these restrictions exceeds the point at which they are beneficial to the public, they become in the same ratio a mere source of monopoly, or a means of benefiting one class of the community at the expense of the remainder. To determine this point is one of the most important and difficult problems in medical legislation.

In France the laws on this subject are so stringent, that no person is permitted to give medical advice in the most trivial cases, without possessing a qualification and a licence. A Chemist is prohibited from preparing any recipe or prescription for a patient, unless written by a medical man; and no person can carry on the business of a Chemist and Druggist, without having undergone an

examination, neither can he employ an assistant who is not qualified.

In Germany, Russia, and some other continental nations, not only are unqualified persons prohibited from practising in any department of the Profession, but the number of regular practitioners is limited by law; only so many being licensed as are considered to be required by the population in their respective districts, and likely to gain an adequate subsistence by their practice. The course of education is definite and complete; and the examinations through which each candidate must pass, are very severe. It is therefore held to be no more than justice to the parties who have fulfilled these conditions, and joined the Profession according to law, that they should be protected by such enactments as will secure to them the remuneration to which they are entitled. On this account the Profession enjoys a monopoly which is rigidly maintained.

In this country the principle of "free trade" prevails to a much greater extent in the Profession; and although the College of Physicians and the Society of Apothecaries possess certain powers of restraining unlicensed persons from encroaching on their respective prerogatives, the laws which confer these powers are so imperfect as to be, in many cases, inoperative; and in the Pharmaceutical department the law takes no cognizance either of the qualifications of educated Chemists, or of the encroachments of persons who are entirely destitute of the needful education.

The manner in which German degrees are sold to Englishmen is a curious instance of inconsistency. A person who wishes to assume the title of M.D. without the trouble and expense of passing through the regular forms of education and examination, sends to Erlangen or Giessen a treatise on any medical subject, purporting to be written by himself, accompanied with the usual fee (about twenty guineas). For this consideration a degree is conferred and a diploma is sent to the candidate. The brass-plate on his door is altered from Mr. Smith to Dr. Smith, or John Smith, M.D., and he puts himself forth to the public as on an equality with educated physicians who have obtained their diplomas in a

legitimate manner. These degrees, which are sold in Germany to Englishmen for the pecuniary benefit of the professors who traffic in them, will not pass current in the country from which they emanate, although they are considered good enough for exportation.

The laxity in our laws on a subject so intimately connected with the public health and the interests of the Profession, has been for many years one of the chief sources of dissatisfaction among medical reformers, who have endeavoured to introduce a system similar to that which exists on the continent. If these endeavours had been temperately and judiciously directed, there is every reason to believe that the object might have been, to a certain extent at least, attained long ago; but the measures proposed having been concocted with reference to the particular views of the parties concerned in the movement, while the interests of other parties and of the public were not sufficiently considered, a violent opposition was the natural result, which occasioned the failure of the project.

Much of this opposition might have been prevented if the Chemists and Druggists had been consulted and conciliated in the matter, since it can easily be shown, that the improvement and protection of one class in the Profession need not militate against the interests of other classes. But the Chemists at that time, not being united as a body, and not being considered a part of the Profession, were either passed over, or classified with the general mass of unqualified persons. Their province not being defined by law, and being established merely by custom according to the circumstances or caprice of each individual, the promoters of medical reform directed their attention more to the suppression of the body as medical practitioners, than to their elevation and protection as practitioners in Pharmacy.

It is obvious that the arguments in favour of restrictions in the Profession apply equally to all departments of it, and that the safety of the public is as much concerned in the suppression of unqualified dispensers of medicines, as it is in the suppression of unqualified medical practitioners. If restrictions are to be established, the

Chemists are quite as much interested in them as any other class of the Profession, and have as much right to be protected by them; but the difficulty in the arrangement consists in defining the boundary lines between the medical practitioners and the Chemists on one side, and between the Chemists and the Grocers, &c., on the other.

It is generally admitted, that in all professions in which health and life are concerned, and in which the public might otherwise be unable to discriminate respecting the qualifications of the parties, the legislature is bound to exercise a salutary influence and control. The primary aim and object of this control is the protection of the public against the dangerous consequences of ignorance; but in so doing, another object is also attained, namely, the protection of qualified persons who have submitted to the prescribed conditions of admission into the Profession. Any system of restrictions in which this order of things is reversed partakes more or less of the nature of a monopoly. For instance, the Apothecaries' Act was designed to prevent unqualified persons from practising as Apothecaries,; but the act is so constructed that its prohibitions appear to extend equally to *qualified* practitioners who do not possess the licence of the Company; and we are told, that a Physician or Surgeon of the highest order could not prepare for his patient the medicine which he prescribes, without becoming liable to the penalty for infringing on the province of the Apothecary. In this respect, the act operates as a monopoly in favour of the Apothecaries.

On the assumption that restrictions on unqualified persons are instituted for the public benefit, it becomes a question how far the judgment and caprice of the public should be controlled by these restrictions? This question has given rise to much controversy. On one side it is urged, that the public being unable to form a correct opinion respecting the attainments of each individual, all practitioners should be examined by competent authorities, and none but those who have passed the examination should, under any circumstances, be allowed to practise. This is the nature of

the medical laws on the Continent ; but it must be recollected, that the wants of the poorer classes are, to a great extent, provided for by hospitals and other charitable institutions, established by the government on a very large scale ; and it is a question, whether the laws can be so rigidly enforced in localities where these means of relief do not exist. In Great Britain it would not be so easy to carry out the principle of restriction to the same extent ; in proof of which we need only advert to the success of some of the most ignorant quacks, the popularity of many secret medicines, and the propensity which prevails to resist any interference with the judgment of the employer in selecting the persons whom he thinks proper to employ, especially where this interference would involve an increase of expense, which might, in many cases, deprive the parties of medical aid altogether. On this account it is thought by many persons that the legislature can do no more than provide the public with qualified practitioners well educated in their respective departments, and prohibit all persons under heavy penalties from assuming any rank or title which they have not attained by passing the prescribed examinations ; leaving the public uncontrolled, and considering that any patient who consults an unqualified person takes upon himself the responsibility of the result.

All parties must concur in the opinion that no person should be allowed to impose upon the public by appearing under false colours, and assuming a rank in the Profession which he has not attained by passing the ordeal required by law ; and heavy penalties should be inflicted in every case in which this regulation is violated. Every qualified person should be duly registered, and the distinctions of rank should be so defined that the public may have no difficulty in selecting practitioners fully qualified in any department. Exemptions and posts of honour or emolument should of course be confined to qualified persons, who are entitled to protection against the encroachments of those who have evaded the prescribed regulations.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

On Wednesday Evening, the 27th of March, Mr. Fownes delivered a

LECTURE
ON THE LIQUEFACTION OF THE GASES.

He commenced by observing:

In the year 1823, Sir H. Davy, then President of the Royal Society, suggested to Mr. Faraday the propriety of making certain experiments upon the solid hydrate of chlorine, a substance not long before discovered by that gentleman, by inclosing it in a narrow and strong glass tube, hermetically sealed, and applying heat to one portion while the opposite extremity was artificially cooled. On performing the experiment, Mr. Faraday observed, in the cool portion of the tube, two liquids of unequal densities, one being pale and the other deep yellow: on opening the tube, the latter instantly expanded into chlorine gas. The second liquid was a watery solution of chlorine. No doubt could exist that chlorine had been condensed to the liquid condition.

The experiment, thus far successful, was then repeated upon other gaseous bodies, the same simple form of apparatus being used, and the liquefaction of the gas effected by its own pressure, as evolved from the materials sealed up in the tube, aided by a little reduction of temperature. Hydrochloric acid, sulphurous acid, sulphuretted hydrogen, carbonic acid, nitrous oxide, cyanogen, and ammonia, gave way in succession, requiring, however, for the purpose, very various degrees of condensation. Mr. Faraday contrived to estimate, roughly, the amount of force required, by inclosing in the tube a fine capillary tube, sealed at one end, and having, near the open extremity, a globule of mercury. The retraction of the included air thus became a measure of the force.

The liquids thus obtained were generally, although not always, lighter than water; they were very thin and limpid, and, chlorine excepted, colourless; when liberated from pressure, they instantly assumed the gaseous form, and often with explosive violence. They are remarkable besides for a most extraordinary degree of expansibility by heat—very far exceeding that of the gases themselves.

Permanent gases are thus apparently only the vapours of excessively volatile liquids in an extremely expanded state. Some, as oxygen, hydrogen, and carbonic oxide, have as yet resisted all attempts to liquefy them, but probably only from inadequate means of obtaining the requisite degree of pressure and cold. The vapours of known liquids, as water and ether, are subject, besides, *in this condition*, to precisely the same physical laws as those which govern the gases proper.

A part of the lecture was then devoted to the consideration of the exact manner in which vapours, and consequently gases, are affected by the separate action of mechanical pressure and reduction of temperature, and the attainment by each, at some particular point, dependent upon the temperature, of a state of *maximum density*, beyond which the gaseous condition cannot be retained. This was illustrated by an experiment upon the vapour of ether.

The next point considered was the intense cold produced by the return of a liquefied gas to its elastic state, involving the principle of the conversion of sensible into latent heat.

When the gases before mentioned were first liquefied, Sir H. Davy suggested the idea of employing the liquids so produced as sources of mechanical power, taking advantage of the great variations of pressure exerted by their vapours by small changes of temperature. Mr. Brunel, in following out this suggestion, went so far as to liquefy carbonic acid in strong metallic vessels to the extent of one and a half pint, and to make the joints of his apparatus perfectly tight. The attempt was subsequently, however, abandoned.

In 1835, M. Thilorier, of Paris, succeeded in greatly simplifying and improving the method of preparation of this curious liquid, by the employment of an apparatus which the lecturer exhibited and put into action; which consists of a pair of exceedingly strong iron cylindrical vessels, furnished with excellent stop-cocks of peculiar construction, and capable of being connected by a copper tube and powerful screws. One of these, destined to serve the purpose of a retort, is mounted upon a frame by a pair of trunnions, so as to swing freely. The charge of materials, consisting of two pounds of bi-carbonate of soda, three pints of tepid water, and enough sulphuric acid, to decompose the salt, are then introduced. The acid is contained in a long brass tube closed at the bottom, set upright in the cylinder, so that it does not mix with the carbonate until the whole is inclined or nearly inverted. The stop-cock is put into its place, and driven home by heavy blows with a mallet. The apparatus is then inclined, and swung backwards and forwards during the space of several minutes to mix the contents completely. At this time, the pressure cannot be much

less than one hundred atmospheres. After a little rest, it is connected with the second vessel or receiver, and the stop-cocks opened. These latter are after a short time closed, the vessels disconnected, and the gas of the generator suffered to escape, after which the stop-cock is removed, the sulphate of soda poured out, and a fresh charge introduced. The operation is repeated five or six times before any large quantity of liquefied acid is collected in the receiver. This latter is furnished with a tube passing nearly to the bottom, through which the liquid is driven with prodigious violence by the elastic force of its own vapour when the stop-cock is opened.

M. Thilorier found that when a slender stream of the liquid acid was thus allowed to issue from a jet into the air, the cold produced by the instantaneous evaporation of a portion is sufficient *to freeze the remainder*, which falls like snow. By receiving the jet of acid into a round brass box furnished with perforated wooden handles, this strange snow-like solid carbonic acid can be collected in quantity and examined. It is comparatively permanent, and but slowly passes into the state of gas, from its exceedingly low temperature, and bad conducting power for heat. If lightly touched, it may be handled without inconvenience, but if pressed upon the skin, causes painful disorganization.

The solidified carbonic acid is insoluble in water, but mixes easily with ether, and in this manner its exceedingly low temperature becomes strikingly apparent. By the aid of a small quantity of this mixture, pounds of mercury may be frozen, and a number of extremely curious and interesting experiments exhibited.

The lecturer illustrated these observations by freezing a large quantity of mercury.

PHARMACEUTICAL MEETING,

APRIL 10th, 1844.

MR. PAYNE, PRESIDENT, IN THE CHAIR.

The Chairman expressed the pleasure which he always felt in meeting the Members and Associates on such occasions of friendly intercourse and scientific improvement, and particularly so in the present instance, as it would be the business of the evening to receive the reports of the lecturers on Materia Medica, Chemistry, and Pharmacy, and to distribute the prizes which were awarded at the examinations at the close of the respective courses of lectures. This was an opportunity of showing the practical working of one great object, he might almost say the principal object, of the Society, namely the School of Pharmacy, and it was gratifying to bestow the reward of merit on those who had in so praiseworthy a manner availed themselves of the advantages afforded by the institution, for the advancement of professional knowledge. The Council were particularly anxious to keep in view the promotion of Pharmaceutical education, in order that, while the members of other professions and trades were striving to maintain the credit and raise the character of their several pursuits, the Chemists and Druggists might not be behind others in any effort which would guarantee to the public the efficient performance of their responsible duties, which consist in supplying medicines of the purest and best quality, and accurately and faithfully dispensing prescriptions.

He (the Chairman), in taking a review of the progress of the School during the two years which had elapsed since its formation, considered that the Society had every reason to feel encouraged with the success which had attended it; since, notwithstanding the difficulties which had presented themselves in the introduction of a plan so novel among the Pharmaceutists of this country, the arrangements which had been made had appeared to be satisfactory, and the School had enjoyed quite as much patronage as could have been expected under the circumstances. It was not merely by the number of students attending the lectures, that this estimate was to be formed, for although it was certainly desirable that this number should be increased, yet independently of those who immediately participated in the instruction afforded at the School, there were many others among whom such a spirit of enquiry and thirst for information had been excited, as could not fail to be productive of the most beneficial results. The students and associates were beginning to feel, more generally than had previously been the case, that they had embarked in an occupation which, if creditably followed,

required a scientific education, and an amount of professional knowledge which rendered systematic study essential. That the School of Pharmacy connected with the Society afforded the means of acquiring the requisite and appropriate information for those engaged in the practice of Pharmacy, would, he believed, be made evident in the course of the evening's proceedings; and he trusted, that through the medium of that, the central establishment, together with the branch Schools which had been founded in different parts of the country, the Society would be enabled to exercise an extensive influence in promoting the qualification of those who offered themselves to the public as Pharmaceutical Chemists.

The Chairman then requested the lecturers to report the result of their several examinations; and observed, that any remarks which they might feel disposed to make, respecting the conduct and attendance of the classes, would be acceptable to the meeting.

Dr. Pereira stated, that he had much pleasure in giving a very favourable report of the diligence, punctuality, and attention of his class. He had never lectured to a more attentive class, or one in which a greater desire for improvement was manifest. This was evinced not only by uniform good conduct during the lectures, but by the nature of the inquiries after lecture, when further explanation was desired. He congratulated the Society on the success of the school, which, considering the short period of its existence, he thought was almost unexampled. The subject (Materia Medica) was generally considered in the medical schools very dry and uninteresting, and consequently that class was not so well attended as the other classes: in fact, he doubted whether in any medical school in London there would be found a more attentive class than that in Bloomsbury Square. The examination with which the course concluded, had fully justified his anticipations by showing that his instruction had not been unavailing. The following are the Questions he had prepared for the Examination to be answered in writing:—

1. State the botanical names and the natural orders of the Plants yielding the following medicinal substances: *Elaterium*, *Saffron*, *West Indian Arrow-root*, *Scammony*, *Manna*, *Ipecacuanha*, and *Allspice* 25

2. What is the general structure, chemical composition, and medicinal properties of the plants belonging to the Natural Order *Labiatæ?* Enumerate the officinal plants obtained from this order 50

3. The powder marked A was sold as powdered Scammony; is it pure? If not, what is the nature of the adulterating ingredient or ingredients? State the reasons for your conclusions 50

4. Name the fæculæ respectively labelled B and C. State the characters by which you distinguish and recognise them* 50

5. How is the presence of Cinchonia in Disulphate of Quina to be detected? 25

6. What are the chemical tests of the goodness of Willow Bark? 25

7. From what plants are the astringent extracts known in commerce as Catechu, Cutch, and Terra Japonica obtained? 25

8. By what chemical character or characters can the resins of Jalap and Scammony be distinguished? 25

9. The bottle labelled D contains two officinal umbelliferous fruits intermixed. You are required to state their names respectively, and to describe the botanical characters by which they are distinguished† 50

10. How is Iceland Moss (*Cetraria islandica*) to be deprived of its bitter matter so as to be fitted to form an article of food? 25

11. By what chemical characters is Guaiacum resin distinguishable from other resinous substances? 25

12. Is the Salt of Sorrel (*Sal Acetosellæ*) of the shops a Binoxalate or a Quadroxalate of Potash? How are these two Oxalates to be respectively distinguished? 25

[*A Microscope and appropriate Chemical Tests, for enabling the Candidates to reply to some of the above Queries, will be supplied on application.*]

These questions had been creditably answered by several, particularly by those to whom the Prizes were awarded, who were as follows;—

First Prize . . . Mr. Charles Cracknell, 106, Edgware Road.
Second Prize . . Mr. Thomas Saunders, 8, Torrington Place.

Mr. Fownes had much pleasure in giving an equally favourable report of the attendance of his class, and the proficiency of those students who had competed for the prizes. The answers of those to whom he had awarded the prizes were particularly good; and three others had approached so near to the successful competitors, that he only regretted it was not in his power to give prizes to them, and he thought it only an act of justice to give them certificates of merit.

The following are the Questions for the Examination in Chemistry.

1. A small phial, counterpoised in a balance, and filled with distilled water at 60°, is found to contain 1325.5 grains of that liquid. Filled with nitric acid to the same point, weights to the amount of 1922 grains are required to restore the equilibrium: —required the specific gravity of the acid 50

* The fæculæ were potato starch and wheat starch.—Ed.
† The fruits were those of hemlock and anise.—Ed.

2. Required a statement of the *law of Mariotte*, connecting the external pressure, volume, and elastic force of gases, with examples 25

3. The rate of expansion of gases by heat is $\frac{1}{460}$ths of their volume at 0° Fahr.—what alteration of volume will 100 cubic inches of a gas undergo, by passing from 50° Fahr. to 80° Fahr.? 25

4. Explain the relation between the Fahrenheit and Centigrade thermometer scales, and give a rule for translating the language of the one into that of the other? 50

5. State the best methods of preparation, and the most characteristic properties of the following substances:—Oxygen, hydrogen, nitrogen, chlorine, iodine, and phosphorus . . 100

6. Give a brief outline of the four great laws of combination, and explain clearly what is meant by the term *equivalent* . 100

7. Describe the mode of preparation, the chemical composition, and the chief properties of the principal compounds of mercury 25

8. Give an outline of the chemical history of ether, and of some of the bodies connected with it 25

The Prizes were awarded as follows:

First Prize . . . Mr. Charles Cracknell, 106, Edgware Road.
Second Prize . . Mr. John B. Hockin, 38, Duke Street, Manchester Square.

Certificates of Merit:

Mr. Robert Howden, jun., 24, Great Russell Street, Covent Garden.
Mr. John Alexander Spencer, 38, Lamb's Conduit Street.
Mr. H. O. Huskisson, Penton Place.

Mr. Redwood thought it unnecessary to give a detailed report of the conduct and attention of his Class, as this would be little more than a repetition of the satisfactory statements just made by the other Lecturers. He had awarded the Prizes as follows:

First Prize . . . Mr. John Williams, 19, Southampton Row.
Second Prize . . Mr. John Horncastle, 221, Tottenham Court Road.

Certificates of Merit:

Mr. S. T. Baxter, 198, High Holborn.
Mr. George Scholefield, 338, Oxford Street.
Mr. H. Humphreys, 2, Queen's Row, Pimlico.

The following are the Questions for the Examination in Practical Pharmacy.

1. Describe the process of Elutriation—the purpose for which this process is adopted, and some of the cases in which it is employed 15

2. How would you proceed to filter the following liquids, in order to remove any solid particles that might be present? State the reasons for any modifications you may suggest in each particular case: — Decoctum Aloës Compositum, Liquor Potassæ, Acidum Hydrochloricum, Oxymel Scillæ, Tinctura Lobeliæ Etherea 20

3. How would you proceed to obtain pure distilled water? Describe the process minutely — State the difference between this and common river-water—and point out some pharmaceutical preparations in which distilled water ought to be used 20

4. What is the difference between the "Alcohol" of the London, Edinburgh, and Dublin Pharmacopœias? What is the best and most economical process for obtaining pure Alcohol? Give particular instructions for conducting the distillation in this process 40

5. What is the proportion of sugar and water in the simple syrup of the Pharmacopœia? Have you any remark to make with reference to this? What is the boiling-point of this syrup, and its specific gravity at 60°, and at 212° of temperature? What are the effects of long-continued boiling on syrups, and in what syrups are these effects most marked? What is the extent of solubility of cane-sugar and of grape-sugar, and under what circumstances is one of these kinds of sugar changed to the other? Describe the nature of this change, and its effect when it occurs in syrups 100

6. How is the Linimentum Æruginis of the Pharmacopœia directed to be made? What are the reactions which take place during the process, and what the nature of the product? . 50

7. Describe the processes for making the following preparations according to the Pharmacopœia, and add any observations that may occur to you with reference to them: — Acetum Scillæ, Oxymel, Extractum Rhei, Extractum Jalapæ, Extractum Elaterii 30

8. Explain fully how you would prepare the following prescription—the order in which you would mix the ingredients—the effect of each addition, and the result of deviating from the right method:

℞ Copaibæ, ℥ss.
Pulveris Acaciæ, ℥j.
Tincturæ Cubebæ, ℥v.
Syrupi, ℥iv.
Aquæ Menthæ piperitæ, ℥vj.

M. ft. Emulsio 40

*** *The Numbers to the right indicate the relative values of the Questions.*

The President at the close of the Reports of the Lecturers, delivered the Prizes in the name of the Council to the successful Candidates. The Prizes consisted of the following works:

MATERIA MEDICA.

First Prize . . . Dr. Pereira's Elements of Materia Medica.
Second Prize . . Dr. Christison's Dispensatory.

CHEMISTRY.

First Prize . . . Graham's Elements of Chemistry, and Parnell's Chemical Analysis.
Second Prize . . Turner's Elements of Chemistry.

PRACTICAL PHARMACY.

First Prize . . . Thomson's Dispensatory.
Second Prize . . Phillips's Translation of the Pharmacopœia.

SYNOPSIS OF A COURSE OF LECTURES ON GENERAL AND MEDICAL BOTANY.

BY A. T. THOMSON, M.D., F.L.S., &c.

To commence on TUESDAY MORNING, 7th of May, and to be continued on each succeeding FRIDAY and TUESDAY during the Months of May, June, and July, at Eight o'clock.

The first portion of the Lectures will be delivered at 17, Bloomsbury Square, and he remainder in the Garden of the Royal Botanic Society, Inner Circle, Regent's Park.

INTRODUCTION.—Advantages of the study of Botany as a science—Method of studying it in reference to the external or physical characters and organic structure of Plants—their functions—and their systematic arrangements; or as STRUCTURAL, PHYSIOLOGICAL, and SYSTEMATIC BOTANY.—Distinction between Botany and Zoology—between Plants and Animals.

I. STRUCTURAL BOTANY is

A. General—comprehending the knowledge of the elementary tissues common to all Plants.
- *a.* Cellular tissue.
- *b.* Vascular tissue.
- *c.* Glandular tissue.
- *d.* Ligneous fibre.

B. Particular—comprehending,

1. ORGANS ESSENTIAL TO INDIVIDUAL VEGETABLE LIFE:

a. Roots—caudex—radicles—fibrils—spongioles—structure of each described. Distinction between aërial and terrestrial roots pointed out. Description of the fibrous—the ramose—the fusiform—nappiform and creeping roots. Functions of roots—reservoirs of vegetable secretions—ages of roots—those employed as medicinal agents described.

b. Stems—Aërial—divided into—1. those which increase by external additions—*Exogens;* 2. those which do not increase by external additions—*Endogens.* Structure and mode of growth of each kind described—branching.
Underground Stems—rhizomes distinguished from roots.
Underground Branches—tubers.

c. Leaves—1. Unexpanded—position on the stem and branches—vernation; 2. Expanded—simple—compound—varieties of form—structure—stomata—pubescence—hairs—stings. Formation of leaves—growth—transmutations—leafless plants.
Underground gems—bulbs—stolons.

d. Stipules—bracts, comprehending involucres—*tendrils.*

2. ORGANS ESSENTIAL FOR THE REPRODUCTION OF THE SPECIES.

a. Flower—definition—arrangement of flowers on the plant, or infloresence—various forms of described; namely, the spike—catkin—spadix—raceme—glomerule—fascicle—cyme—umbel—panicle—thyrsus—corymb.

b. Floral envelopes—calyx—corolla—imperfect flowers.

c. Generative organs—anther—pollen—pistil—ovary.

d. Offspring—ovules—fruit—seed—embryo.

e. Lateral progeny—sporules—germs.

II. PHYSIOLOGICAL BOTANY.

Cohesiveness—permeability—endosmose—exosmose—irritability—ascent of the sap—respiration—exhalation—secretion—excretion—transpiration—temperature—assimilation—fertilization—age—decay—fall of the leaf—germination of seeds—reproduction of asexual plants.

III. SYSTEMATIC BOTANY.

a. Artificial System—description and explanation of the Linnæan.

b. Natural System—description of—its advantage over the artificial.

Particular descriptions of medicinal plants—to be delivered in the Botanic Garden, and illustrated by the living plants in the ground.

REGULATIONS FOR THE STUDENTS

DURING THEIR ATTENDANCE IN THE ROYAL BOTANIC GARDEN, INNER CIRCLE, REGENT'S PARK.

1. Every Student, attending the above Course of Lectures, will be admitted to the Garden every morning, except on Sundays, the days on which the lectures are delivered in Bloomsbury Square, and on the 4th of June, and the 2d of July, at seven o'clock in the morning, and he may remain until ten o'clock; but not after that hour.
2. Every Student, on first going to the Garden, and for four or five successive mornings, must show his ticket to the gatekeeper; and he must enter his name in a book to be kept for that purpose, every morning of visiting the Garden, during the continuance of the Course; after the conclusion of which, his right of admission will cease.
3. Students will be permitted to examine the growing plants, which are labelled; but must not cut or take any specimen, without the permission of the Professor, or the head gardener.

4. The whole range of the Garden will be free to the Students, within the above-mentioned hours.
5. The Conservatories may be visited by the Students, in small parties, under the guidance of the Professor.

DONATIONS TO THE LIBRARY AND MUSEUM.

TO THE LIBRARY.

		Presented by
New Dispensatory for the use of the Military Hospital abroad	1752	Mr. R. M. Mills, (Bourn)
Vogler's Pharmaca Selecta, &c.	1788	Mr. Edward Palk, (Southampton)
Pharmacopœia Gallica	1818	Mr. Bell.
Béral's Nomenclature et Classification Pharmaceutiques	1830	Mr. Dinneford.
The Holy Bible, containing the Old and New Testaments	1839	Mr. Thomas Francis, at Messrs. Hodgkinson and Tonge's.
New Experiments on Building Materials, by John Hutchinson, M.R.C.S., &c.	1843	Mr. J. F. Blandford.
Pinax Theatri Botanici, Caspari Bauhini		Mr. James Holden, (Burley, Yorkshire).
Essay on the Food of Plants, by George Fownes, Ph. D., 2 copies	1843	Mr. Fownes.
Thomson's London Dispensatory, 10th edit.	1844	Dr. A. T. Thomson.
Furnivall on the Treatment and Prevention of Consumption and Scrofula	1844	Dr. J. J. Furnivall, (through Mr. Hooper, Great Russell Street, Covent Garden).
Hocken on the Comparative Value of the Preparations of Mercury and Iodine in the Treatment of Syphilis		E. O. Hocken, M.D.
Notes sur un Noveau Caractère Specifique de la Strychnine, et sur un procéde pour préparer l'Azote Pur, par M. Eugène Marchand.	1843	M. Eugène Marchand, (Fécamp.)

TO THE MUSEUM.

Mr. Hulse, *Leadenhall Street.*—Seeds of forty-four plants from St. Vincent's—Mace and Nutmegs from St. Vincent's.

Mr. Maddox, *Tonbridge Wells.*—Crystal of Sulphate of Barytes.

Mr. Savory.—Benzoate of Ammonia—Dragon's Blood, fine specimen.

Messrs. Thomas Hodgkinson & Co., *Snow Hill.*—Fine specimens of Sarsaparilla—Cinchona Bicolor (Pitaya Bark)—Young Huamalies, or Brown Cinchona Bark—Specimens of Cinchona, from Valparaizo.

Mr. Morson.—Carbonate of Magnesia, obtained by Mr. Pattinson's process.

Mr. Squire.—Pure White Wax (German)—White Briony Root.

John Reeves, Esq., *Rectory Green, Clapham.*—Specimen of Chinese Galls (Woo-pei-tsze).

Mr. R. M. Mills, *Bourn.*—Box containing numerous Minerals.

Mr. Goodbarn, *Rio de Janeiro.*—Specimens of the wood, bark, and leaves of a species of Copaifera (probably C. trapezifolia Hagn.) and of the oleo-resin drawn from the same—Leaves of the Rosewood Tree—Spirit made by the fermentation of the pulp of the Coffee-berries.

Mr. Spencer, *Lamb's Conduit Street.*—Specimen of West India Castor Oil.

Messrs. Horner.—Bottle in which Quicksilver was imported from China. (see page 539).

Messrs. Pigeon & Son.—Simaruba Bark, very fine.

PIPER ANGUSTIFOLIUM, OR MATICO.

(*See our last Number, page* 473.)

PROVINCIAL TRANSACTIONS.

At a meeting of the Bath Branch of the Pharmaceutical Society, the following paper was read, on the

ANALYSIS OF THE BATH WATER.

BY MR. H. M. NOAD,

Lecturer on Chemistry at the Bath Branch of the Pharmaceutical Society, &c.

In consequence of the prevailing opinion that both iodine and potash exist in the Bath waters, I took an opportunity, whilst engaged in delivering a course of chemical lectures to the members of the Bath Branch of the Pharmaceutical Society, in the summer of last year, of making an analysis of these celebrated springs: the results of my examination were communicated in a paper which was read at a meeting of the members of the Society in September, and, at the request of the President and Secretary, I have drawn up, for publication in the Pharmaceutical Journal, the following account of the investigation:—

The temperature of the water, as it rises from the spring at the King's Bath, was found to be 115° Fahr.

The specific gravity 1002.4, water being 1000.

From eighteen gallons 2140 grains of solid matter were obtained, equal to 14.87 grains per imperial pint.

In order to ascertain the existence of iodine, Mr. Tylee was kind enough to superintend the careful evaporation of twenty gallons of the water taken fresh from the King's Bath. The heat employed was never above 200° Fahr.; when the liquid was reduced to about two pints it was removed from the copper boiler, thrown on a filter, and treated with boiling distilled water till the quantity was increased to four pints, again concentrated by evaporation, refiltered, and the clear liquor tested for iodine in the following manner:—

A few drops of sulphuric acid were stirred into the liquid, a tablespoonful of clear solution of starch was then added, and mixed well, *chlorine* was expelled by heat from its solution in water contained in a Florence flask, and conveyed by a bent tube immediately over the surface of the saline solution, no *blue tinge* was perceptible, though when a minute fragment of hydriodate of potash was stirred into the liquid, and the vapour of chlorine allowed to fall on its surface, abundant indications of the presence of free iodine were obtained.

A large glass jar capable of containing about three quarts was

then filled with the mineral water hot from the spring, a little solution of starch added, and the chlorine test applied as before, but no iodine could be detected.

1000 grains of the dry residuum were then treated with boiling water, till all the soluble matter was removed; the clear liquid was tested as before, but with like negative results.

Now, according to Stromeyer, starch will detect free iodine in a liquid containing $\frac{1}{450000}$th of its weight of that principle, if therefore any iodine does exist in the Bath waters it must be in a proportion less than the above, and probably beyond the reach of chemical detection.

Having, however, seen in the *Chemical Gazette* a new method of applying the starch test, which is stated by the author, M. Bonjean, to be even more delicate than the above, I submitted the Bath water to it, following the directions given by M. Bonjean. A certain quantity of the water was conveyed into a porcelain crucible; to this was added a small quantity of recently prepared and concentrated solution of starch, upon which a drop of nitric acid was let fall, but no *colouring* was noticed, though, according to M. Bonjean, nitric acid is capable of detecting the presence of an alkaline iodide in solution equal in weight to not more than $\frac{1}{4000000}$th of the weight of the solution (?).

To ascertain whether any salt of potash was present in the water, 200 grains of the solid residuum were digested with eight ounces of distilled water, filtered, slight excess of hydrochloric acid added, and the solution evaporated to two ounces; it was then divided into two parts: to one an alcoholic solution of *chloride of platinum* was added, and the whole evaporated nearly to dryness on a water-bath, then transferred to a filter and washed with alcohol, a considerable quantity of chloride of sodium (which is very sparingly soluble in alcohol) remained on the filter, but there was no appearance of the yellow double chloride of platinum and potassium. The chloride of sodium was subsequently crystallized.

To the other half a strong solution of *tartaric acid* was added, but after standing some time there was not the slightest crystalline deposit.

A fresh portion of the solid residuum was then dissolved, and the solution treated with *carbazotic acid*, but no indications of the presence of potash could be obtained.

Another portion was then dissolved, and *hyperchloric acid* added, the mixture was cautiously evaporated nearly to dryness, and then treated with alcohol, the whole was dissolved, which would not have been the case had any potash salt been present.

Having thus ascertained that neither iodine nor potash exist in

the water, I proceeded to a general examination of the composition of the saline contents.

To determine the quantity of chlorine, an imperial quart of the water was concentrated by evaporation, a few drops of nitric acid were added, then solution of nitrate of silver, the *chloride of silver* obtained weighed 17 grains = 4.2 grains of chlorine.

To determine the proportion of sulphuric acid, a few drops of pure hydrochloric acid were added to an imperial quart of the water, then solution of *chloride of barium*; the resulting sulphate of barytes weighed 34 grains = 11.68 sulphuric acid.

To ascertain the amount of carbonic acid in combination with alkaline or earthy bases, an imperial quart of the water was carefully evaporated to dryness; the residue (29.9 grains) was transferred to a little apparatus consisting of two light bottles connected together by a small bent tube passing from their sides; into one of these bottles the saline matter was placed, and in the other about a quarter of an ounce of diluted hydrochloric acid; the mouths of the two bottles were then loosely stopped with cotton wool, and the whole accurately weighed; by inverting the bottle containing the acid, the whole was mixed together, and after the slight effervescence had ceased, a very gentle heat was applied, so as to expel the whole of the carbonic acid, any vapour being prevented from escaping by the cotton wool; when the whole was cold, it was again weighed, the loss of weight amounted to .5 grain.

An imperial quart of the water was carefully evaporated to dryness, the heat towards the last being very gentle, the saline matter crystallized in small acicular tufts all over the bottom of the basin, it was removed and heated for three or four hours in a platina capsule, at about 500° on a sand bath; it was then a perfectly white powder, and weighed 29.8 grains.

This powder was thrown on a filter and repeatedly washed with boiling distilled water; to the washings a few drops of nitric acid were added, then slight excess of ammonia, no precipitate; muriate of ammonia was then added, then oxalate of ammonia, as long as any precipitation took place, the resulting oxalate of lime was converted into carbonate by heat; it weighed 6.7 grains = 3.765 lime = 2.7 calcium.

To the filtered solution phosphate of soda and ammonia were added, a precipitate was produced, which weighed, after ignition, 2.6 grains = 1.04 magnesia = .638 magnesium.

The solid matter insoluble in water was then treated with dilute *pure* hydrochloric acid; to the solution a few drops of nitric acid were added, and heat applied, the free acid was then neutralized by ammonia, muriate of ammonia added, then *hydrosulphuret of ammonia*, a black precipitate followed, which was

collected on a filter washed with water (to which a few drops of hydrosulphuret of ammonia were added), then digested in hydrochloric acid, filtered, and the solution supersaturated with ammonia, peroxide of iron was precipitated, which after ignition weighed .075 grain = .1087 *protocarbonate* of iron.

To the solution freed from sulphuret of iron, hydrochloric acid was added, boiled to expel the sulphuretted hydrogen, and filtered, a slight excess of ammonia added, then oxalate of ammonia, the resulting oxalate of lime was converted by heat into carbonate: it weighed 8.15 grains = 4.585 lime = 3.3 calcium.

To the filtered liquor, phosphate of soda and ammonia were added: the resulting phosphate of magnesia weighed .8 grain = .32 magnesia = .2 magnesium.

A small quantity of residue, insoluble both in water and acid, remained in the filter, it was well washed, dried, and ignited, it then weighed .7 grain; heated with carbonate of soda before the blowpipe, it fused into a bead of transparent glass: it was therefore *silica*.

To an imperial quart of the water, a few drops of nitric acid were added, the whole was then evaporated to dryness, and the dry residue treated with dilute nitric acid: the undissolved residue weighed as before .7 grain, and proved to be silica.

The next object was to determine the amount of *soda*, which was done by separating the lime, magnesia, and sulphuric acid, and estimating it as chloride of sodium and carbonate of soda, in the following manner:—

An imperial quart of the water was concentrated by evaporation, filtered, and *barytes water* added as long as any precipitate fell; carbonate of ammonia was then added, by which all the excess of barytes, together with the rest of the lime, was precipitated; the filtered liquid was evaporated to dryness in a platina capsule, and ignited, it weighed 7.5 grains: this was digested in dilute nitric acid (half a grain remained undissolved) filtered, and to the clear liquid, nitrate of silver was added, 14 grains of chloride of silver were produced = 5.72 grains chloride of sodium, or of 3.45 grains of chlorine, and 2.27 of sodium.

Now, if from the whole 7.5 grains which were submitted to the action of dilute nitric acid, we deduct 5.72 grains of chloride of sodium and .5 grain of insoluble residue, we shall have left 1.28 grain, which may be considered as carbonate of soda =.75 soda or .56 sodium.

The following is, therefore, a simple statement of the saline substances—which analysis shows to be contained in an imperial quart of Bath water:

	Grains.
Lime	8.3500
Magnesia	1.3600
Silica	.7000
Sodium (with Chlorine)	2.2700
Soda (with carbonic acid	.7500
Sulphuric acid	11.6800
Chlorine	4.2000
Protocarbonate of Iron	.1087
Carbonic acid	.4813
	29.9000

The next question was, How are these substances arranged? —what are the salts actually existing in the water? There is no doubt whatever that in the saline matter left on evaporation, the lime is in combination with sulphuric acid, and the sodium with chlorine; and that therefore sulphate of lime and chloride of sodium constitute by far the greater part of the compound. If this view of the composition of this mineral water be taken, it may be represented thus:—

	Grains.
Sulphate of Lime	20.0500
Chloride of Sodium	5.7200
Carbonate of Soda	1.2000
Chloride of Magnesium	1.4880
Silica	.7000
Protocarbonate of Iron	.1087
Error	.6333
	29.900

But the opinion, that the substances obtained by evaporation from a compound saline solution, are necessarily those which previously existed in it, has long been abandoned, the concentration by evaporation *may*, and, in many cases, *must* change the actual combinations, and give rise to new products by decomposition: thus, in the mineral water in question, the *soda* may have been in combination with *sulphuric acid*, and the *lime* (calcium) with *chlorine*. It is true, that sulphate of soda and chloride of calcium cannot exist together in a concentrated solution, but in a dilute solution they may, and the reaction will not take place until the solution is sufficiently concentrated to admit of the influence of the *force of cohesion;* then sulphate of lime, being insoluble, will be formed, and chloride of sodium, being very soluble, will remain in the liquid.

There are several circumstances which induce me to believe that this interchange of acids and bases does actually take place during the evaporation of Bath water. In the first place, when heat is applied to a vessel containing the water, a deposit begins to take place almost immediately; it increases rapidly as the

evaporation proceeds, nor can it again be entirely redissolved by boiling with double the quantity of distilled water.

In the second place, sulphate of lime and chloride of sodium are *inert* substances, and cannot possibly be supposed to communicate to these waters their active qualities. Chloride of calcium, on the other hand, is a salt of considerable medicinal power, and together with the carbonate of iron (which though present in such minute quantity, exerts undoubtedly a considerable effect on the system on account of its volatility), may probably be considered as representing the active ingredient of the water.

Again, it is the opinion of many distinguished Chemists, that whenever chloride of sodium exists in a mineral water, we may expect to find iodine; but as has been already stated, my experiments to detect this principle were quite unsuccessful.

The composition of Bath water may therefore be represented, thus:

	Grains.
Chloride of Calcium	5.4500
Chloride of Magnesium	1.4800
Sulphate of Soda	6.9600
Carbonate of Soda.....	1.2000
Sulphate of Lime	13.3100
Silica	.7000
Protocarbonate of Iron.....	.1087
Error	.6913
	29.9000

in an imperial quart.

In this scheme I have calculated the quantity of *chloride of calcium*, which is equivalent to the *chloride of sodium* actually obtained by analysis. There still, however, remains 13.3 grains of sulphate of lime; which, as it cannot be formed from the mutual decompositions of any of the other salts, must be considered as an original ingredient. I have chosen also to represent the small quantity of carbonic acid as in combination with *soda*, in preference to *lime;* first, because it is the most soluble compound and secondly, because the quantity of soda actually found corresponds very closely with that of the carbonic acid.

There is another view which may be taken of the states of combination in a mineral water, it was pointed out first, I believe, by the late Dr. Murray. The acids and bases may be supposed to exist not in those binary combinations which form the different compound salts, but in *simultaneous combination*, constituting properly one compound, the composition of which is subverted so as to form the binary compounds obtained only by the influence of the force of cohesion, exerted in the analytic operations.

This ingenious view is strongly supported by the well-known

fact, that the substances found by analysis in a mineral water, may be artificially combined in many different ways, and dissolved in water, without producing a mineral water possessed of the active properties of that intended to imitate.

"There is no doubt," observes Dr. Murray, "that this view may be maintained, for there is no conclusive proof of the actual existence of binary compounds previous to their being obtained by precipitation or crystallization; nor is there any direct improbability in the assumption, that in elements existing in a state of solution, having all of them mutual attractions, and exerting, at the same time, an attraction to the common solvent, an equilibrium may be produced producing simultaneous combination and mutual neutralization.

"Admitting the opinion of simultaneous combination, it would afford a more satisfactory explanation of the powers of mineral waters than the common opinion does: for the elements in such a combination may form an active compound, and one even possessed of specific qualities. It is only on the assumption that the products obtained by evaporation are the ingredients, that the difficulty exists, the very process of evaporation causing the combination to pass into that state in which the least active compounds are formed."

Shawford, April 4, 1844.

ORIGINAL AND EXTRACTED ARTICLES.

ON THE PRESERVATION OF PLANTS FOR HERBARIUMS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Great Yarmouth, April 1844.

SIR,—"TYRO" requires directions for the formation of a Hortus Siccus; instructions for that purpose may be found in Lindley's Introduction, book iv., chap. 6., "of Herbaria;" but the following remarks may not be unacceptable to beginners. In forming a collection, it is necessary to attend to the gathering, naming, drying, mounting, and arranging of the specimens; they should be collected as far as possible in dry weather, and when the dew is off, but this cannot always be attended to, botanists must get specimens as they best can. When the size will admit, the whole plant must be taken, as well as the root—if not, one or more pieces of the size of the paper used. Care should be taken that they be

characteristic of the plant, presenting any variation in the leaves, where such exists, and the plant in flower and fruit if possible; then ascertain the names of your plants or proceed as far in that direction as practicable. The young botanist will preserve many plants he cannot name, and in an excursion, it is sometimes unavoidable to postpone minute examination; but it is better to make all the observations possible upon the recent plants. Then comes the important process of drying: this is performed by pressure between paper or something of the sort until they form flattened, thoroughly dry specimens, retaining as far as possible the natural appearance, form, and colour of the plants. The pressure may be applied by means of a screw press, by heavy weights, or by boards and straps: the press, being likely to crush the parts, is objectionable, the best and most convenient method is with boards and straps; for this purpose procure two boards three-eighths of an inch thick, each formed of two parts, one part with the grain running lengthwise, the other crosswise of the board, glued together one above the other; if of one piece, they invariably split: these are quite stout enough for any strength required, and light enough for carriage—they may be made about the size of the paper used. A few pieces of stout blotting-paper having been laid upon one of the boards, as many specimens as convenient are to be laid upon them, in their natural positions and in as fresh a state as possible, then paper, again specimens, paper over them, and so on till they are all laid out; the other board being placed over, the whole is to be tightly bound together, with leather straps or stout cord. After about twenty four hours they should be looked over, and laid between fresh papers or the papers dried; it is commonly recommended to place them between freshly dried papers daily, but in a dry season, or in a warm dry apartment, with plenty of paper, this is unnecessary and frequently injurious; of course the attention required will vary with the succulency of the plants—the grand thing in drying good specimens is to interpose plenty of thick porous paper, and keep the apparatus in a warm dry situation; during an excursion so much paper may not be convenient, and then we must dry our papers frequently at the fire. Papers dipped in a solution of chloride of calcium, and thoroughly dried, have lately been recommended between layers of flannel or cotton wool; some dip their plants in hot water before drying, with the view of preserving their natural colour, others say it spoils the specimens and is never necessary; but it seems to be required with such plants as the crassulaceæ, which otherwise retain their vitality for a considerable time, and obstinately refuse to dry; as to colour, it certainly preserves that of some blue corollas. I have plants of borago officinalis dried seven years back, with the corolla as blue as

when gathered, with which this plan has been used, but it is apt to injure; it must be borne in mind that the parts, especially of the flower, should be preserved in such a state as shall admit of dissection and examination at any future period.

Having been well dried, the specimens are now to be placed upon paper, for this purpose half-sheets of foolscap are convenient; the specimen may either be glued down or fastened with straps of paper glued to the half-sheet—if the strap be passed through the paper on each side the stalk and fastened at the back, it adds much to the neatness. The name should be written on the paper—the left-hand lower corner is convenient; and the locality, date of gathering, and remarks somewhere near the plant, taking care that, should more than one specimen be placed upon the same paper, it may not be uncertain which is referred to; each paper must contain but one species, but may frequently have several specimens. Then, for their arrangement and preservation, a convenient method is to put the plants of one natural order into a wrapper of cartridge or other stout paper, folding it as you would a powder paper, on which the name of the order should be written; in many instances several orders may be placed in one wrapper and use may be made of the alliances and groups in *Lindley's Natural System* for their arrangement; in others, orders must be divided; a convenient number of parcels may then be put between millboards and tied in a bundle, on which put a label of contents to facilitate reference. To preserve the plants from insects, they may be smeared with a solution of corrosive sublimate in spirit, or kept in cases with camphor; they should be kept in a dry apartment.

I am, Sir, yours respectfully,

J. P. Priest.

ON THE PRESERVATION OF PLANTS FOR HERBARIUMS.*

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—In reply to the inquiry of your Correspondent "Tyro," in your last number, I beg to send you my plan for preparing a Hortus Siccus, or Herbarium, which is, I believe, in principle, that adopted by most botanists.

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* [Although some portions of this letter are almost a repetition of observations contained in the former, we publish both entire, in preference to mutilating either of them. At this season of the year, which is the commencement of the most favourable period for the study of botany, we are glad of this opportunity of drawing the particular attention of our junior readers to the subject.—Ed.]

There are many modes of drying plants, and I have tried several, but the following answers exceedingly well, while it has the great advantage of being one of the most economical. Procure a quantity (say half a ream or a ream) of the coarse blue paper used by grocers for wrapping sugar in, its size is eighteen and a half inches by thirteen, and it may be procured at any wholesale paper warehouse for fourpence halfpenny per pound (I think half a ream weighs about twenty pounds), demy gray is recommended by the Edinburgh Botanical Society, but is not easily to be met with. The blue paper may be obtained anywhere. A couple of boards must be provided, they should be the size of the paper, and one inch thick, and should also be clamped at the ends to prevent their warping. Then proceed as follows:—having gathered your specimens, take one of the boards, and lay upon it six or seven sheets of the paper; on this lay out carefully one or more specimens, so as to display the plant in as natural a manner as possible; lay over them a few sheets of the paper, and then some more specimens, and so on. As a general rule, four sheets of paper are sufficient between each layer of specimens, except in the case of succulent or woody plants, in which case six or seven will be necessary. A little practice, however, will be the best guide in this respect. Very thick or woody stems may have the underside pared away. When all the specimens gathered have been laid in, let a few extra sheets be added, and then lay on the second board, on which place some heavy weights. The pressure applied should be proportioned to the quantity and nature of the plants in process of drying; but it should not be less than forty nor more than one hundred pounds. Every, or every other day, it will be necessary to shift the specimens into fresh and dry papers, and the paper which has been taken away should be freed from the moisture it has absorbed, by thorough drying by heat, mere exposure to the air is not sufficient. A large number of plants will thus be completely dried in three or four days, and very few will take more than six or seven.

The next process is the arrangement of the dried specimens into a Herbarium. For this purpose I use folio post paper of good texture, size fifteen and a quarter inches by nine and a half. The particular kind which I use, and which is the best adapted for a herbarium of any I have seen, may be obtained at 104, Leadenhall Street, at sixteen shillings per ream. I appropriate a sheet to each *species*. The specimens are fastened with gum on the inner right hand page of each sheet, and on the opposite one I write the botanical and English names, Linnæan class and order, natural order, and locality. I also write the botanical name at the top of each sheet outside. As it is often requisite

to have more specimens of a species than a single sheet will contain, as in the carices, ferns, rubi, &c., additional specimens of the same species may be fastened on half sheets of the same paper, and laid *within* the species sheet. Before placing the plants in their appropriate place in the herbarium, I wash every specimen lightly over with a camel's hair pencil dipped in a solution of corrosive sublimate, made by dissolving thirty grains of the latter in four ounces of rectified spirit. This effectually preserves them from the attacks of insects to which otherwise they are very liable. Now for the *arrangement* of the specimens: I arrange mine on the natural system—and I think this will be found best, for though I am warmly attached to the Linnæan system, and always examine plants by it, yet the other should be studied as well, and therefore I prefer it for a herbarium arrangement. I have a half-sheet of blue double crown paper folded for each genus; on the outside I write the botanical name of the genus, and its included species, and within it I lay the sheets of all the *species* of that genus which I possess. I have a similar sheet of white paper for each natural order, within which all the *genera* of that order are laid. For the following natural orders, which are extensive, cruciferæ, leguminosæ, rosaceæ, umbelliferæ, compositæ, labiatæ, scrophulariaceæ, amentaceæ, cyperaceæ, gramineæ, and filices, I provide a couple of boards to each, made the size of the paper, and three-eighths of an inch thick; the order being placed between the boards, I tie them together lengthwise with pink tape. This keeps the specimens flatter and in better order. The boards cost about two shillings per dozen. The orders are placed in boxes, made like a music-case, with a lid at the top, and the front hinged so as to fall down on a level with the bottom. I have these boxes made of the size of my paper, and six and a half inches deep, which accommodate from two hundred and fifty to three hundred species in each box.

Finally, as an index to the whole, either the Edinburgh or London Catalogue of British Plants may be used; I have both, and against each species or variety which I possess, I mark an asterisk in red ink. I may just add, that I possess a Collection of British Plants, containing nearly 1000 species, prepared and arranged in the way now described. It is very easily kept in thorough order, and in a state of constant readiness for convenient reference. Should your Correspondent require further information, he will find details of other plans in Macgillivray's Abridgment of Withering's British Plants; Directions for collecting and preserving Botanical Specimens, published by the Botanical Society of Edinburgh; and in the Phytologist, pp. 585, 621, 674-6, 683, 770. The Phytologist is an invaluable and inte-

resting periodical, to all interested in the study of British Botany. I remain your obedient Servant,

AN ASSOCIATE.

P. S. I enclose specimens of plants dried as detailed above, that you may see how far the colour and character of the plants are preserved by it.

[The Specimens are very well preserved, and in good condition.—ED.]

ON THE USE OF ZINC VESSELS FOR CONTAINING MOLASSES.

(EXTRACT OF A LETTER FROM A CORRESPONDENT).

SOMETIME since I noticed an article in your Journal on the subject of using zinc milk vessels, &c., as follows:—

"I would scarcely have believed," says Dr. Elanes, of Berlin, "that zinc vessels could again have come into use for holding any *fluids* used for *alimentary purposes*, as Vauquelin, forty years ago, proved that such were certain, after a short time, to hold a considerable portion of zinc in solution. I have found, by experiments, that a solution of *sugar*, which had stood only a few hours in the summer in a zinc vessel, contained a considerable amount of zinc salts. It has been often stated, that the cream will separate more easily from milk, if the latter be kept for a short time in a zinc vessel. As however, it is known, that milk will turn acid much sooner than a solution of sugar, it is the more to be apprehended that some zinc will be dissolved, and such milk will be the more noxious, as it is well known that even a small amount of zinc will cause violent spasmodic vomiting."

Now, Sir, some parties in the iron trade, are now making tanks of iron plates, coated with zinc by Sorel's process, which gives it a very thick covering, for the purpose of holding molasses, and, I believe, of bringing it from the West Indies, and, I suppose, they would go out full of water.

It struck me, therefore, that if a mere solution of sugar would have the poisonous effect mentioned by Dr. Elanes, that it would be a very dangerous experiment to subject a zinc surface to the action of molasses, containing, as it does, a great deal of acid, for the length of a West India voyage, under a broiling sun, by which, of course, its acidity by fermentation will be much more active; and, as the tanks mentioned are, I expect, intended as a trial, and, if approved, to become the sole medium of conveying molasses to England, we shall, on some fine morning, unless we keep a bright look out, find a wholesale poisoning going on.

I thought the subject of so much importance as to write to you requesting your insertion of this letter, as a means of directing the attention of some able Chemist, of whom no doubt many are readers of your Journal, to the subject; and, in the mean-

time, shall be thankful for your own opinion in your next Journal on the point.

Of the danger of molasses and zinc I think there is little doubt; but I should also be glad to know if it will have any evil effect on water, should the tanks be used for that purpose, as water is sometimes kept in tanks for one, two, or three years, and sometimes even more.

[We apprehend that no objection could apply to the use of zinc vessels for holding water, on any grounds alluded to by our Correspondent.—Ed.]

A FEW OBSERVATIONS ON MR. MOWBRAY'S REPLY.

BY RICHARD PHILLIPS, F.R.S., &c., &c.
Honorary Member of the Pharmaceutical Society.

Sir,

My observations on Mr. Mowbray's reply shall be short; in the remarks on his formula I showed that the quantity of hydrochloric acid which he directed to be saturated with iron, amounted to twenty-six equivalents, instead of only eighteen, as he stated; to explain this, he says, that your printer gave him no opportunity of correcting a mistake, derived from an erroneous copy of his formula, and the result is that 1.16 is twice printed, instead of 1.116, as he intended. Why your printer omitted to extend the usual privilege to authors is for him to explain.*

Mr. Mowbray has been equally unfortunate with the printer of a work called *The Chemist*, in which also twice appears the error of 1.16 for 1.116, accompanied by every other misstatement which occurs in the Pharmaceutical Journal. It certainly does seem to be a most unusual combination of casualties, that two printers should have received similarly erroneous copies of a document, and that neither of them should have given the author a chance of correcting the mistakes.

The chief error contained in Mr. Mowbray's paper, he attempts thus to get over: "Let him [Mr. Phillips] and the reader, insert the figure 1 after the decimal point, where the specific gravity of the muriatic acid to be used is indicated; that is, let sp. gr.

* [In justice to ourselves we must deny the charge. It having been intimated that a few lines of personalities would be erased from the paper when published in this Journal, Mr. Mowbray requested to have a copy of it in its original and complete state. This was forwarded to him in time to have been returned to us corrected, if any errors had been found in it. We cannot account for this not having been done, except by the fact that the paper, in its original state, appeared in the *Chemist;* the copy sent to Mr. Mowbray was the only one sent out by us in that form.—Ed.]

1.116 be substituted for specific gravity 1.16, and all Mr. Phillips's objections vanish."

Dr. Ure's table of the strength of muriatic acid of different densities will, indeed, show that this insertion of 1, reduces the 26 equivalents of acid to about 18 equivalents, and let it be admitted that it so stood in Mr. Mowbray's original paper, yet I may remark, that 1.16 is the Pharmacopœia density—that the quantity of it directed will dissolve about 725 of the 960 of iron to be used, whereas the acid of 1.116 will take up only 535 ; I must, however, freely admit that so great an excess of iron is by no means incompatible with the idea that Mr. Mowbray directed its employment.

I will now repeat some of my objections which have not "vanished" by the ingenious correction proposed :

18 eq. Hydrochloric Acid are stated instead of 10.
2 eq. Chlorate of Potash are represented by 246 instead of 248.
2 eq. Sulphate of Iron are represented by 250 instead of 278.
2 eq. Sulphate of Potash must be represented by 167.1 instead of 176.
2 eq. Oxygen are totally omitted from the diagram.

And this alone is sufficient to nullify and render abortive the whole explanation of the changes which occur. I regret to find that I did Mr. Mowbray the injustice to suppose, that he "strongly recommended" his "facile" process; it appears that his preference was bestowed on another formula, which may be the better, but can scarcely be the worse of the two that he has presented to the world.

IMPORTATION OF CHINESE QUICKSILVER.

A good deal of interest has been excited in the Drug Market lately in consequence of the importation, for the first time, of some quicksilver from China. This new article of Chinese commerce arrived on the 8th of March, by the Sappho, from Canton. It was enclosed in bottles containing about twenty pounds, made of a kind of bamboo; each bottle being formed by cutting the reed beyond two of its joints. The quicksilver appears to have been introduced through a small orifice at one end, and the opening subsequently stopped with melted resin. The whole of the bottle is covered with linen cloth, which has been cemented on. The quicksilver is quite equal in quality to that introduced from other sources, but the quantity imported has not been such as to affect the market price.

ON THE DOUBLE SALTS OF IRON.

BY MR. HEMINGWAY.

In case 1, hydrated sesquioxide of iron was added to a boiling and concentrated solution of citric acid: it was observed to dissolve readily and in large quantity up to a certain point. A further addition left the solution turbid, apparently from excess of oxide. The mixture was now suffered to cool, was then filtered, evaporated to a treacly consistence, and dried in thin layers on well glazed earthenware: it separated in lamellæ of an acicular form and garnet colour, scarcely soluble in cold water, but more readily in hot. Fifty grains of this salt, dried at 212°, were examined as to the quantity of oxide contained; it yielded fourteen grains = 28 per cent. Another portion, prepared after the same manner, yielded fifteen grains = 30 per cent.

In case 2, two several quantities of citric acid and hydrated sesquioxide of iron were kept at a temperature just sufficient to influence to combination until chemical action had ceased. The solutions were filtered, reduced, and dried, as in case 1. The salts separated in lamellæ, but of a short and broad sort. These were in like manner submitted to examination, when there were found in one 22 grains of oxide, and in the other 25 grains of oxide, per cent.

In case 3, I proceeded as in case 1, until the whole of the oxide derived by precipitation from four parts and a half of commercial sesquioxide had been added to five parts and a half of crystallized citric acid, and gentle ebullition was continued for fifteen or twenty minutes. In appearance much of the oxide remained unchanged; but it was evidently in combination, for on the addition of an alkali, it was totally and instantly dissolved. Owing to the variable quantity of real oxide existing in the article sold in the shops, this experiment will not be uniformly successful. From an experiment which will be detailed in a subsequent part of this paper, this combination of oxide of iron and citric acid will be inferred to be in the ratio of 80 to 140, or of one equivalent of oxide of iron to two equivalents of crystallized citric acid.

In case 4, tartaric acid was substituted for citric, and subjected to the same treatment as described in case 1. As soon as the solution appeared turbid, one half was removed, filtered, and dried at 212°, when one hundred grains were found to be impregnated with twenty-six grains of sesquioxide of iron. I did not repeat this experiment. To the remaining half, more oxide was added, and during the continuance of this part of the operation, a bulky hydrated bitartrate of iron was thrown down, very nearly resembling hydrated sesquioxide of iron, but differing in being totally soluble in alkalies. This precipitate was well washed and dried at a gentle heat, which was raised towards the close of the process to 212°, and there kept until it ceased to lose in weight. One hundred grains were then heated to redness; it first evolved a suffocating inflammable vapour, then charred, and finally left me thirty-seven and a half grains of residue; the residue was dissolved in nitro-hydrochloric acid, precipitated with caustic ammonia, and washed. It was again heated to redness, when there were found to be thirty-six grains nearly*.

In case 5, acetic acid was digested at a common temperature with the hydrated oxide; union was readily effected, and by adding a little alcohol, and filtering, a beautiful solution was obtained, which after a lapse of

* It is stated in *Rose's Manual of Analytical Chemistry*, that ammonia completely precipitates sesquioxide of iron from its solution in aqua regia: an impression is now gaining ground that such a statement is inaccurate.

months, had only a very trifling deposit. A quantity of this solution was left to spontaneous evaporation in divided portions of say half an ounce each ; the great bulk suffered decomposition in drying, and I only obtained from a pint of solution about one scruple in a perfect state, and about as much more in a slightly imperfect * condition. The perfect salt is in lamellæ of a ruby colour, and is soluble in water ; ammonia precipitates oxide of iron from its solution, and the affinity between the oxide and acid is so trivial, that a little elevation of temperature is sufficient to overbalance it ; in its dry state it will bear considerable heat without alteration ; before examination, I held it some minutes very near to a common fire. The twenty grains of *slightly* imperfect salt were made up to twenty-five, and heated to redness ; after fifteen minutes it was found to weigh eight grains : the remainder was preserved, as I did not like to part with the very little that was with difficulty obtained.

It appears to me that the nature of the precipitate soluble in alkalies, spoken of in cases 3 and 4, has been mistaken, and that they have been confounded with the oxide of iron itself. I some while ago met with an observation, but have failed to discover it since, to this effect—"The further addition of oxide (meaning addition after solution had ceased), causes the separation even of that portion which had been previously dissolved." A writer in the *Pharmaceutical Journal*, vol. i, p. 595, says, "Let the oxide be added in excess." M. Beral also directs that "rather more oxide should be added than the acid will dissolve." Whatever may be the value of these remarks, or how much they may conflict with each other, it is not my present business to enquire ; I refer to them, because individually, and together, they do seem to imply that the fact of the oxide combining after solution had ceased, has been overlooked ; and possibly to the prevalence of this oversight we may attribute much of the erroneous impression which so generally obtains. On a further comparison, I find that more of these results are not coincident with the opinions of some others : the writer in the *Pharmaceutical Journal*, to whose paper I have alluded, after a description of M. Beral's process, has the following—"The oxide of iron and citric acid combine in the proportion of forty parts of the oxide to seventy of the crystallized acid." The same is repeated by Dr. A. T. Thomson, in the last edition of his work on Materia Medica. I have repeatedly tried, without success, but with some uniformity as to result, to obtain a citrate of iron in scales so constituted ; and as these proportions seem more fitly to apply to a compound of a different description, I would respectfully leave to these gentlemen to determine whether some error in computation may not have attended their investigations.

Regarding what has been stated in the preceding cases as matter of evidence, I see not how to escape from the conclusion, that in case 3, and latter part of case 4, we are presented with definite compounds of sesquioxide of iron with citric and tartaric acids ; indeed, the constitution of the tartaric acid salts determined theoretically, and by experiment, agreed so very closely, as to leave little room for dispute, and with the citric acid salt it is not much more discordant. The combination of the oxide with acetic acid is also to be considered as definite, inasmuch as all acid uncombined must have escaped during the evaporation. The quantity of oxide in twenty-five grains of the dry salt held a few minutes before the fire, was found to be nearly eight grains, but this estimate, owing to causes before mentioned, is a trifle too high : now, by a theoretical computation, a salt composed of four equivalents of acetic acid, and one equivalent of oxide of iron, should contain seven grains (rather more than less) of oxide in the

* The imperfection consisted in minute opaque dull spots, arising from disengagement of acetic acid and deposition of oxide.

same quantity; which, therefore, is probably the actual constitution of the article in question.

But it may fairly be doubted whether the products of the first and second operations have an equivalent constitution; the examination did not corroborate such an idea: nevertheless, both a tercitrate and quadricitrate may exist, and the latter supposition gains support from the probability of acetic acid combining in the same proportion.

Sesquioxide of iron is not precipitated from its combination with citric and tartaric acids, by alkalies, alkaloids, earthy and some metallic oxides: according to Professor Brande, malic, mucic, kinic, and pectic acids, lead to the same result. It has been found that double salts are formed, the precise constitution of which, Chemists are by no means agreed on: my own observations induce me to regard a binary series, the existence of which I will endeavour to demonstrate.

I took bicitrate of ammonia, and to its boiling solution added hydrated oxide of iron so long as a *greenish-yellow* colour was retained, or so long as a distinct *red* absented itself: the solution must be boiled a few moments after each addition of oxide, or the effect will not be observed: when the process is complete, we have a combination of one equivalent of bicitrate of iron with two equivalents of citrate of ammonia. I obtained from one specimen so made, very nearly twenty-two grains of oxide per cent., and from another twenty-four grains: it dries in scales of a golden colour.

Again, I took the precipitated oxide derived from four parts and a half of commercial sesquioxide, and boiled it with five parts and a half of crystallized citric acid, and after continuing ebullition a short time, it was supersaturated with caustic ammonia; it was then filtered, and cooled quickly, and I had a solution most difficult to evaporate without decomposition, but which, when dry, was perfectly soluble: one hundred grains of this salt afforded me nearly thirty-six grains of oxide of iron. I am sorry to say, another gentleman to whom I gave a portion of this salt, only obtained thirty-four grains: pardon my attaching importance to this circumstance. It was my request that before examination notice should be taken that the salt was dry, for it is of so deliquescent a nature, that by long keeping, or transferring from one bottle to another, it absorbs water. I was sorry therefore to find, by his note to me, that he had tried the salt in the state I sent it to him. It is true, he remarked, that the salt appeared quite dry, but there might have been water, and my impression is, there was, and that his estimate is too low: under these circumstances, I think I am entitled to split the difference, and call it thirty-five.

I submit it to you whether I may not with reason infer that the real constitution of this salt is one equivalent of citrate of iron, and one equivalent of citrate of ammonia; that is,

Sesquioxide of Iron	80	or	37.56
Citric Acid.....	116	"	54.46
Ammonia	17	"	7.98
Equivalent.....	213		100.00

What now forces itself upon the mind—what but the conviction that these two compounds are the representatives of two distinct series of chalybeate salts? I anticipate the objection that I do not show by analysis that my theory is exactly confirmed. It is true, I come only very near the point, but I ask, let it be recollected that these salts are uncrystallizable; that on this account it is most difficult to keep the one series from interfering with the other; and this practical difficulty has been the cause, I think, of the uncertainty of opinion that is current amongst us. I show two compounds, one containing very nearly one equivalent of oxide of iron united to one equivalent of acid, the other containing one equivalent of oxide of iron

united to two equivalents of acid ; they have peculiar external characters and are arrived at by different means. I point out how this "not quite" is to be explained, and I do think that in forming my opinion I have followed closely in the track of inductive science ; I determined to rest the preceding part of my argument on what, with all the correction I have bestowed on it, still remains weak and defective, because, trusting to my formula, I had given to several gentlemen samples of a salt which proved to be less perfect than I have made it at other times. This difficulty, which opposes itself to the establishment of a superseries among citric salts, will not be felt when I come to treat of the analogous compounds with tartaric acid. We have been long familiar with an example of the inferior series of tartaric acid salts in the officinal potassio-tartrate of iron ; I therefore shall not now further occupy myself with them. The superseries is made evident in the following manner :—The bitartrate of iron resulting from the operation in case 4 is to be saturated with potash or ammonia ; the solution is to be then filtered and carefully dried in small quantities at a time ; I found ammoniacal salt to contain thirty-five grains of oxide : estimated theoretically, it is a fraction short of this quantity. Thus—

One equivalent of oxide of iron	80	or	34.93
Two equivalents of tartaric acid	132	"	57.64
One equivalent of ammonia	17	"	7.43
	229		100.00

To one or other of these two series, or to a mixture of both, the whole of the double iron salts, containing the sesquioxide, with which I am acquainted, are capable of being referred. The difficulty attending the manufacture of perfect salts of the superseries, is such as to render it improbable that they can ever become extensively used. The ammonio-citrate of commerce contains an average of thirty per cent. of oxide ; and in this state it is more permanent. A salt having this constitution, is made without much trouble as follows :*

* The preparation of the hydrated oxide is an important point in the formation of these salts ; the London College orders the sesquichloride to be decomposed with caustic potash ; the Edinburgh directs the persulphate to be similarly treated with caustic ammonia. My own plan in detail differs from both of these. I make a solution of the sesquichloride according to the directions of the London College, adding nitric acid to insure the complete peroxidation of the iron, but instead of decomposing cold, diluted, and with a caustic alkali, I mix the solutions warm, somewhat concentrated, and use a carbonated alkali, and for these reasons: a moderate degree of heat is favourable to chemical action, and when conjointly with this, double elective affinities are in operation, decomposition is more complete, *and the liability to form a basic salt is considerably diminished.* Again, if the solution is very weak, the precipitate will be of so buoyant a nature that the process of ablution will be tedious. As soon however as the oxide is precipitated, longer retention of heat is absolutely mischievous, and large quantities of cold water must be added without delay, and the washing continued until the supernatant liquor is tasteless ; the remaining water being drained off, the oxide is ready. To this it has been objected, that carbonic acid has no affinity for sesquioxide of iron. I apprehend that affinity does exist, although ordinarily it does not influence to combination ; how else shall we explain the fact that solutions of sesquicarbonate of ammonia and bicarbonate of potash dissolve, under pressure of carbonic acid, sesquioxide of iron ? That an affinity exists, I think is manifest ; and that it prevents failure in making the hydrated oxide I am inclined to believe : at all events, I have not formed a basic salt since I have adopted the plan of decomposing with carbonate of ammonia.

Take a bisalt of any third constituent (bicitrate of ammonia for example), made by adding a known quantity of citric acid to a similar quantity exactly neutralized with ammonia. This solution in its turn is to be saturated with hydrated oxide, which is accomplished by mixing the oxide gradually so long as it continues to be dissolved, avoiding any great excess. This formula admits of very general application by simply changing the acid, or the third constituent, but there are exceptions.

Dr. A. T. Thomson observes on the ammoniacal citrate, that it disagrees with some constitutions more than its congener the potassio-tartrate. Guided by this opinion, I would direct attention to the compound of tartaric acid, iron, and potash, obtained by dissolving the hydrated bitartrate in a solution of the caustic alkali; if they be mixed in such proportion as to keep the bitartrate slightly in excess, supersaturating at the end with ammonia, a salt will be obtained perfectly but slowly soluble in cold water, substantially consisting of tartaric acid, iron, and potash, and belonging to the superseries of double salts. The admixture of ammonia is advised, first, because it is impossible to separate any excess of potash, should there be any; and, secondly, because it is difficult to effect complete combination without such excess.

In pursuing this investigation, the present nomenclature of the Pharmacopœia seemed incapable of comprehending the double series which opened itself to view; and on searching for a better, I soon found myself on ground which was occupied by contending parties. The unsettled point consisted in this: Is the iron, or the third constituent, to become the adjective adjunct to the acid? In other words, is a compound of tartaric acid, oxide of iron, and potash, to be called potassio-tartrate of iron, or ferro-tartrate of potash? Many, whose names command the greatest respect, continue to make the third constituent express the quality of the acid; and these have custom for their stay. On the other hand, it is contended that this nomenclature conveys erroneous impressions of the constitution of the salt; and the argument is thus summed up by Dr. Pereira in his *Elements of Materia Medica*: "The ferro-tartrate of potash is to be regarded as a double salt, in which tartrate of iron is the acid or electro-negative ingredient, and tartrate of potash the electro-positive or basic constituent. On this view we comprehend why ferro-cyanide of potassium and the alkalies refuse to act on it in the way they do on the ordinary ferruginous salts until an acid be added." But the author in adopting a nomenclature, leaves the double *proto*salts unprovided for. If then, the electric condition of these oxides is such that we are obliged to regard them in the light of acids rather than bases, it seems consistent that, with Berzelius, we should apply the usual termination of acids to them. Acting on this suggestion, the class of double chalybeate salts would resolve itself into—

Ferr*ic* or *sesqui*oxide salts,

Ferr*oso*-Ferr*ic* or magnetic oxide salts.

And ferr*ous* or *proto*xide salts.

The ferric salts would be subdivided into true ferric, or such as have *one* equivalent of oxide united to *one* equivalent of acid; and diferric salts, or such as have *one* equivalent of oxide united to *two* equivalents of acid. The name of the one would then be ferrico-citrate of ammonia; of the other, diferrico-citrate of ammonia.—*London Medical Gazette.*

STEEL WINE.

BY M. SOUBEIRAN.

On leaving white wine to act on iron filings, the quantity of iron which enters into solution depends upon the proportion of acid contained in the wine, and on this account the product must be liable to variation. On the

other hand, if the formula given by Parmentier, and adopted in several works, which consists in adding tincture of tartarized iron to white wine be followed, the composition of the steel wine will be still more variable, for the tincture of tartarized iron is a very uncertain preparation; moreover, the medicine thus prepared, would not resemble, in composition, that made by the direct action of the wine on metallic iron.

In adopting the following formula, the inconveniences above alluded to will be avoided; while, at the same time, there will be the advantage of its being applicable to the preparation of any quantity, however small, of the medicine, and of its occupying a very short time.

Take of Tartrate of protoxide of iron.....	1 part
Tartaric acid.....	1 "
White Wine	1000 parts

Rub the tartrate of iron and tartaric acid together in a porcelain or glass mortar, then add the white wine, and filter the solution if necessary.

M. Beral has recommended, in order to prevent the discolouring of the wine by the iron, to add a little hydrated peroxide of iron to the wine first, to shake them together and filter, then to add the filtered wine to the iron filings. The effect is precisely as indicated by M. Beral; but if Bourdeaux wine be used, and this is the kind I have employed, the difference in the discolouration of the wine, whether the oxide of iron be used as directed or not, is so little perceptible, that this part of the process may be omitted.

The preparation of tartrate of protoxide of iron is very simple. It consists in decomposing an equivalent of protosulphate of iron with an equivalent of neutral tartrate of potash, instantly washing the precipitate with water, collecting it on a strainer, pressing it strongly, and drying over a water-bath.—*Journal de Pharmacie.*

OINTMENT OF IODIDE OF POTASSIUM.

BY MESSRS. SMITH, EDINBURGH.

℞ Potassii Iodidi.
Aquæ, aa ʒj.
Axungiæ, ℥j.

Dissolve the iodide of potassium in the water, and then mix the solution with the lard.

This differs from the ointment of iodide of potassium as usually prepared, the salt being in a state of perfect solution, a condition favourable to its absorption.—*Journal de Pharmacie.*

ON THE FORMATION OF HYDROCYANIC ACID FROM THE RE-ACTION OF NITRIC ACID ON ALCOHOL.

BY M. DALPAIZ.

The author having had occasion to prepare some spirit of nitric ether according to the process of the London Pharmacopœia, observed that the product afforded a white floculent precipitate with nitrate of silver, possessing all the characters of cyanide of the metal. The formation of hydrocyanic acid under the circumstances was an interesting fact; but M. Dalpaiz was not satisfied with having observed it, he was anxious to study the influence of varied proportions of acid and alcohol, and of different degrees of temperature, upon the phenomena observed.

He distilled, by the heat of a water-bath, a mixture of

Rectified spirit, sp. gr. .847	360 grammes.
Distilled water.....	180 "
Nitric acid, sp. gr. 1.384	90 "

The products being collected in five separate parts all afforded precipitates with nitrate of silver, and these precipitates together weighed 0.65 of a grain.

A fresh mixture of

Spirit, sp. gr. .827 .....100 grammes.
Nitric Acid, sp. gr. 1.384.....100 "

Was gently heated in a large retort. Ebullition continued for two minutes, without the solution of nitrate of silver, into which the products were received, being rendered in the least degree turbid, but all at once there was so great a disengagement of hydrocyanic acid that the liquor instantly became milky and curdy. Unfortunately a few seconds afterwards the retort broke, and the disengaged vapours were so highly charged with hydrocyanic acid, that the operator was obliged to quit the laboratory. The result of this experiment being inconclusive, M. Dalpaiz recommenced it, taking the precaution to moderate the action of the ingredients, by applying cold water to the retort. In this instance the proportion of hydrocyanic acid disengaged was extremely small, and it is probable that none would have been formed if the action had been moderated still further. An elevation of temperature, therefore, is favourable to the formation of hydrocyanic acid.

M. Dalpaiz concludes his paper by observing that, of the numerous examinations he had made of specimens of commercial nitrous ether, with the view of ascertaining whether they contained hydrocyanic acid, nearly the whole had afforded negative results ; but that he had always found a considerable portion of formic acid.

These researches of M. Dalpaiz have been very favourably reported upon by Messrs. Bernard, Derose, and Chatin. The experiments which these gentlemen undertook in connexion with their report, show that hydrocyanic acid is produced in notable quantity during the action of nitric acid on fatty bodies. They state also, that when one part of alcohol and two parts of nitric acid are carefully distilled, the product does not contain the least trace of any compound of cyanogen.

We may add, that the formation of hydrocyanic acid during the reaction of nitric acid on certain organic matters, is not a recent observation. In 1839 M. Gauthier de Claubry proved the presence of hydrocyanic acid in the alcohol left after the preparation of fulminates ; and in the following year M. Sobrero showed that it was also formed on distilling nitric acid with volatile oils or even with some resins. M. Thenard also, some time ago, announced that this acid was one of the products of the reaction of nitric acid on sugar, gum, &c. Nevertheless, the observations made by M. Dalpaiz, with reference to the particular case to which he has alluded, are interesting and valuable.—*Journal de Pharmacie.*

ON THE PREPARATION OF DIACETATE OF LEAD.

The last edition of the French Pharmacopœia, and several treatises on Pharmacy, among others, the two editions of Soubeiran's work, recommend the preparation of solution of diacetate of lead in the following manner :—

Take of Acetate of Lead, in crystals, 3 parts.
Litharge in powder, 1 part.
Distilled Water, 9 parts.

Boil in a copper pan until the oxide of lead is dissolved, and the solution marks 30° Beaumé (sp.gr. 1.264).

The promptitude with which copper becomes oxidized under the influence of heat, a salt of lead, water, and atmospheric air, ought, according to M. Leroy, Pharmacien of Brussels, to cause the use of copper vessels to be abandoned in making this preparation. If a copper pan be used, it is impossible, notwithstanding the precautions that may be adopted, to prevent the

solution from becoming impregnated with that metal, and sometimes to such an extent as to colour the solution green.

Professor Soubeiran, it is true, recommends another process, which is preferable, and which consists in putting three parts of acetate of lead, one part of litharge, and eight parts of water, into a porcelain mortar or capsule, and stirring the mixture frequently during several days, or until the whole of the oxide is dissolved. The time required in this process causes the preference to be generally given to the former one.

M. Leroy, being anxious to prevent the introduction of copper into the solution of diacetate of lead, while, at the same time, the process is rendered expeditious, adopted the following method, which afforded a good product, of the proper density, and without any contamination of copper:

Put three parts of crystallized acetate of lead, either into a porcelain capsule, or a glazed earthen vessel, with nine parts of distilled water; place this over the fire, and heat it just to its boiling point; remove it now from the fire, and add, in small quantities at a time, one part of litharge in fine powder, constantly stirring the mixture. The solution of the litharge will be completed in a few minutes, when the liquor may be filtered. When cold, this will have a density of 35° Beaumé (sp. gr. 1.321).

This proposed modification by M. Leroy, of the process usually adopted in the preparation of the saturnine extract, having engaged the attention of M. Deschamps, of Avallon, he has published the process, which he has adopted for some time past. This process differs only from that of the Pharmacopœia in the introduction of a few pieces of metallic lead into the copper pan with the other ingredients, and in the boiling being continued until, after introducing,

Acetate of Lead, in crystals	1500 parts.
Litharge in powder	500 "
Distilled Water	4500 "
Clippings of Lead	Q.S.

5810 parts shall remain in the pan, the lead being included in the tare of the pan. This will have a density when boiling of 30°. The copper pan will be perfectly preserved by the lead.—*Journal de Pharmacie du Mèdé.*

ON THE MODE OF PREPARING COD LIVER OIL.

BY M. A. TROUSSEAU.

The cod's livers are taken out, and thrown into large tubs, exposed to the heat of the sun. A limpid oil then runs out, which has but little odour, and is highly esteemed in commerce, although it has no medicinal virtue. Incipient putrefaction soon takes place in the livers, and a fresh quantity of oil escapes, which is brown and transparent, has a fishy taste, and leaves an acrid sensation at the bottom of the throat when swallowed. This oil, which commercially is of second quality, is more active as a medicine than the first.

Lastly, to complete the extraction of the oil, the livers, already putrid, are thrown into iron vats, and a third quantity of oil is separated by boiling. This is brown, but little transparent; has a disagreeable and empyreumatic odour of fish; its taste is very acrid. It is this oil which should be employed to the exclusion of the other qualities, especially the first.—*Traité de Thérapeutique et de Matière Medicale.* Bruxelles.

[We think this prejudice in favour of stinking cod liver oil is calculated to injure the reputation of the remedy. We have seen a variety of cases published in the medical periodicals of this country, in which a favourable report is given of the efficacy of the oil in a state in which it is by no means disgusting.—Ed.]

ATOMIC WEIGHTS AND EQUIVALENTS OF SIMPLE BODIES.

If last year we were called upon to give the equivalents with the atomic weights, we feel this year the more anxious to do so as Liebig (in his *Annals*) and several French Chemists make use of the formulæ of equivalents for organic bodies, at least for water and ammonia. *From this year we shall also adopt the formulæ of equivalents*, as the value of this proceeding will, no doubt, be generally acknowledged. It is well known that Gmelin has changed the equivalents for the atomic weights, in the new edition of his *Handbuch*: thus, he has changed the names, but in effect has made no alteration, since the magnitude of his atomic weights corresponds with our (and his former) equivalents. We beg to draw attention again to the distinction which has been recently made between true and spurious equivalents. The former are such as have been, in all cases, proved correct by experience; the latter such as have not met with that general approbation as those of *gold*, *mercury*, *copper*, *glucinum*, *zirconium*, *aluminum*, *silicium*, *boron*, and *titanium*. The equivalents of *nitrogen*, *phosphorus*, *arsenic*, and *antimony*, taken at the double of their atomic weights, appear more correct. All atomic weights determined in the course of last year, although not included in the table itself, will be found mentioned in the notes, with additional observations.—*Pharmaceutisches Central Blatt*, No. 1. Jan. 3, 1844.

[On comparing the following table with the corresponding table for last year (see Pharmaceutical Journal for March, 1843), it will be perceived that the only essential changes are in the numbers for *calcium* and *uranium*. The other alterations are merely corrections of typographical errors.—Ed. Pharm. Journ.]

NAMES OF BODIES.	SYMBOLS.	ATOMIC WEIGHTS.		EQUIVALENTS.	
		O = 100.	H = 1.	O = 100.	H = 1.
Aluminum	Al.	171.167	27.432	171.167	13.716
Antimony	An. or Sb.	806.452	129.243	1612.904	129.243
Arsenic	Ar. or As.	470.042	75.329	940.084	75.329
Barium	Ba.	856.880	137.325	856.880	68.663
Bismuth *a*	Bi.	886.918	142.139	886.918	71.069
Boron	Bo. or B.	136.204	21.828	136.204	10.914
Bromine	B. or Br.	489.153	78.392	978.306	78.392
Cadmium	Cad. or Cd.	696.767	111.665	696.767	55.833
Calcium (*Berzelius*, 1843. p. 680)	Cal. or Ca.	251.942	40.304	251.942	20.152
(*Dumas, Erdmann, & Marchand*) *b*	—	250.000	40.000	250.000	20.000
Carbon (*Berzelius*)	Car. or C.	76.438	12.250	76.438	6.125
(*Liebig*)	—	75.850	12.140	75.850	6.070
(*Dumas*)	—	37.500	6.000		
(*Marchand & Erdmann*)	—	75.000	12.000	75.000	6.000
Cerium (*Berzelius*)	Ce.	574.796	92.102	574.796	46.051
(*Beringer*) *c*	—	577.000	92.928	577.000	46.464
Chlorine	C. or Cl.	221.326	35.470	442.652	35.470
Chromium	Chr. or Cr.	351.815	36.382	351.815	18.191
Cobalt	Co.	368.991	59.135	368.991	29.568
Columbium, or Tantalium	Col. or Ta.	1153.715	184.896	1153.715	92.448
Copper	Cu.	395.695	63.415	395.695	31.707
Fluorine	F.	116.900	18.734	233.800	18.734
Glucinum (*Berzelius*), or	G. or	331.261	53.088	331.261	26.544
Beryllium (*Awdejew*) *d*	Be.	58.084	9.308	58.084	4.654
Gold *e*	Au.	1243.013	199.207	1243.013	99.604

NAMES OF BODIES.	SYMBOLS.	ATOMIC WEIGHTS.		EQUIVALENTS.	
		O = 100.	H = 1.	O = 100.	H = 1.
Hydrogen (*Berzelius*)	H.	6.239	1.000	12.478	1.000
(*Dumas & Erdmann*)	—	6.250	1.000	12.500	1.000
Iodine	I.	790.460	126.567	1580.520	126.567
Iridium	Ir.	1233.499	197.682	1233.499	98.841
Iron *f*	Fe.	339.205	54.363	339.205	27.281
Lanthanium *g*	Lan. or La.	451.879			
Lead	Pl. or Pb.	1294.498	207.458	1294.498	103.728
Lithium	Li. or L.	80.375	12.881	80.375	6.440
Magnesium	Mg. or Mag.	158.353	25.378	158.353	12.689
Manganese	Mn. or Man.	345.887	55.432	345.887	27.716
Mercury	Hg.	1265.822	202.863	1265.822	202.863
Molybdenum	Mol. or Mo.	598.520	95.920	598.520	47.960
Nickel	Nic. or Ni.	369.675	59.245	369.675	29.622
Nitrogen, or Azote *h*	N.	88.518	14.186	177.036	14.186
Osmium	Os.	1244.487	199.444	1244.487	99.722
Oxygen (*Berzelius*)	O.	100.000	16.026	100.000	8.013
(*Dumas, & others*)	—	100.000	16.000	100.000	8.000
Palladium	Pal. or Pd.	665.899	106.708	665.899	53.359
Phosphorus	P.	196.143	31.436	392.286	31.436
Platinum	Pla. or Pt.	1233.499	197.682	1233.499	98.841
Potassium, or Kalium *i*	Po. or K.	489.916	78.515	489.916	39.257
Rhodium	Rh. or R.	651.387	104.392	651.387	52.196
Selenium	Se.	494.582	79.263	494.582	39.631
Silicium	Si.	277.312	44.442	277.312	22.221
Silver *k*	Ag.	1351.607	216.611	1351.607	108.305
Sodium, or Natrium	So. or Na.	290.897	46.620	290.897	23.310
Strontium	Str. or Sr.	547.285	87.709	547.285	43.854
Sulphur	S.	201.165	32.239	201.165	16.119
Tellurium	Tel. or Te.	801.760	128.500	801.760	64.250
Thorium	Th.	744.910	119.292	744.910	59.646
Tin	Sta. or Sn.	735.296	117.840	735.296	58.920
Titanium	Ti.	303.662	48.664	303.662	24.332
Tungsten, or Wolframium	Tu. or W.	1183.000	189.590	1183.000	94.795
Vanadium	Va. or V.	855.846	137.157	855.846	68.578
Uranium *l*	Urnm. or U.	750.000	120.000	750.000	60.000
Yttrium *m*	Yt. or Y.	402.514	64.508	402.514	32.254
Zinc *n*	Zn.	403.226	64.621	403.226	32.310
Zirconium	Zir. or Zr.	420.201	67.340	420.201	33.670

NOTES.

a *Werther*'s paper (*Central Blatt*, 1843, p. 76) renders it almost certain that the oxide of bismuth is $Bi_2 O_3$, and that the old number 1330.3 should be again adopted. (*Central Blatt*, 1838, p. 296. *Jacquelain*).

b *Central Blatt*, 1842, p. 711.

c *Central Blatt*, 1842, p. 566. *Hermann* (*Central Blatt*, 1843, p. 854) assumes 575 — 92 (equiv. 575 — 46).

d *Central Blatt*, 1842, p. 631. Glucina = Be O. According to *Damour* (*Central Blatt*, 1843, p. 783), it is more probably $G^2 O^3$.

e The equivalent of gold is no doubt more correctly doubled, or taken as = 2486 — 199.2.

f According to *Wackenroder* (in *a Treatise shortly to be published*), the peroxide of iron contains 30.028 per cent. of oxygen; the atomic weight of iron would then be = 349.533 — 55.920, and the equivalent 349.533 — 27.960, or $(7 - 3\frac{1}{2} + O)$.

g According to *Choubine*, *Rammelsberg* found 454.88. *Hermann* (*Central Blatt*, 1843, p. 858) assumes 600 — 96 (equiv. 600 — 48). According to *Mosander* (*Central Blatt*, 1843, p. 770), the atomic weight is 580.

h Recent experiments appear to lead to the number 87.5, or to the equivalent 175 = 14. Reckoning according to the specific weight of nitrogen (*Dumas and Stas*), we find 175.8. *Soanberg* (*Jahresbericht*, 22) obtained from anhydrous nitrate of lead, as a mean, 174.37. *Anderson* recently (*Central Blatt*, 1843, p. 959).

i *Marignac* (*Central Blatt*, 1843, p. 60) takes the atomic weight of potassium at 490 ; the equivalent, therefore, at 39.3.

k According to *Marignac* (*Central Blatt*, 1834, p. 60), exactly 1350.

l According to *Rammelsberg* and *Peligot* (*Central Blatt*, 1843, pp. 577, 174, 407), *Ebelmen* contends for 742.875. *Wertheim* (*Central Blatt*, 1843, p. 586).

m The correctness of these numbers is rendered dubious by the recent experiments of *Rose* (*Central Blatt*, 1843, p. 605), and of *Mosander* (*Central Blatt*, 1843, p. 771).

n *Jacquelain* (*Central Blatt*, 1842, p. 748) found 414. Perhaps, the equivalent 412.5 = 33 is the true equivalent.

CHEMICAL ANALYSIS OF GUANO.

BY T. OELLACHER.
Apothecary at Insbruck.

[*Continued from page* 504.]

ENUMERATION OF THE RESULTS OBTAINED.

I. *Constituents insoluble in Water.*

A. 1.69 per cent. of magnesia (sect. 25) form, with 1.40 per cent of ammonia, and 2.92 per cent. of phosphoric acid, and 3.69 per cent. of water, 9.70 per cent. of basic phosphate of ammonia and magnesia—to this must be added afterwards that portion of the double salt which was dissolved by the water.

B. After deducting the 2.92 per cent. from the 14.13 per cent. of phosphoric acid (found in sect. 23), necessary for the formation of the double salt (sect. *A.*), there remain 11.21 per cent. of the acid which require 8.95 per cent. of lime to form 20.16 per cent. of phosphate of lime.

As according to section 24, the whole quantity of lime amounts to 9.88 per cent.; 9.88 — 8.95 = 0.93 per cent. of lime combined with carbonic acid (sect. 8, and sect. 21), must be brought into calculation as 1.65 per cent. of carbonate of lime.

C. The amount of ammonia in the constituents insoluble in water was found (sect. 12) to be 2.46 per cent. ; as of this quantity 1.40 per cent. were used (in sect. *A.*), there remains 1.06 per cent. of ammonia which forms with 10.58 per cent. of uric acid separated (in sect. 26), and with the necessary constitutional water 12.20 per cent. of urate of ammonia. This expression

is, although near the truth, not quite correct as the uric acid obtained was impure.

			Quantity of Ammonia.
Basic Phosphate of Ammonia and Magnesia	Section *A.*	9.70	1.40
Phosphate of Lime	" *B.*	20.16	
Carbonate of Lime	" *B.*	1.65	
Oxalate of Lime	" 22.	1.30	
Urate of Ammonia	" *C.*	12.20	1.06
Substance resembling wax	" 27.	0.75	
Sand	" 21.	1.68	
Constituents insoluble in water		= 47.44 per cent.	2.46 per cent.

This number is very nearly equal to that found (in sect. 11), where the quantity of constituents insoluble in water was given summarily as 47.38 per cent.

II. *Constituents soluble in Water.*

D. As the 4.60 per cent. of sulphuric acid (of sect. 14) must be supposed to be divided among the most potent bases, and as further the 4.00 per cent. of sulphate of potash (of sect. 15) consist of 1.84 per cent. of sulphuric acid, and of 2.16 per cent. of potash, the remaining 2.76 per cent. of sulphuric acid combine with 2.16 per cent. of soda to form 4.92 per cent. of sulphate of soda.

E. 0.92 per cent. of phosphate of magnesia (of sect. 16), represent 1.93 per cent. of basic phosphate of ammonia and magnesia, which were dissolved in the aqueous solution, and contain 0.28 per cent. of ammonia. If we add this quantity of double salt to the quantity found (in sect. *A.*), the total will amount to 11.93 per cent., containing 1.68 per cent. of ammonia.

F. Those 6.78 per cent. of phosphate of magnesia (of sect. 17) contain, the total amount of phosphoric acid of the dissolved phosphates, with 0.92 per cent. of phosphate of magnesia (of sect. 16); on deduction of the latter, 5.86 per cent. of phosphate of magnesia remain, whose phosphoric acid is contained in guano in combination with ammonia, as 6.90 per cent. of phosphate of ammonia, consisting of 3,71 per cent. of phosphoric acid, of 1.79 per cent. of ammonia, and of of 1.40 per cent. of water.

G. In section 7, we have shown that on exposure to heat, the phosphoric acid drives off the sulphuric, but not the muriatic acid; and (in sect. 13) 9.44 per cent. of incombustible salts were obtained on addition of sulphuric acid, which, according to the experiments, could only contain:—

α. The portion of Phosphate of Magnesia (of sect. 16) remaining after heating the 1.93 per cent. of basic Phosphate of Ammonia and Magnesia	0.92	per cent.
β. The Phosphoric Acid of the Phosphate of Ammonia (of sect. *F.*).....	3.71	"
γ. The Potash of the Sulphate of Potash (of sect. *D*)	2.16	"
δ. The Soda of the Sulphate of Soda (sect. *D*)	2.16	"
	8.95	
The surplus of	0.49	
which is necessary to make up the weight of those	9.44	per cent.

of incombustible salts, must consist of sulphate of soda, into which the chloride of sodium is converted. From a comparison of the atomic weights,

it follows, that these 0.49 per cent. of sulphate of soda were originally contained in guano, as 0.40 per cent. of chloride of sodium or common salt.

H. As the whole quantity of chlorine, according to section 20, amounts to 1.73 per cent., but the 0.40 per cent. of chloride of sodium (of sect. *G.*) contain 0.24 per cent. of chlorine ; 1.73 — 0.24 = 1.49 per cent. of chlorine was combined with ammonium to form 2.25 per cent. of muriate of ammonia, corresponding with 0.72 per cent. of ammonia.

I. The 9.00 per cent. of oxalic acid (demonstrated in sect. 18), were contained in the guano in combination with 8.50 per cent. of ammonia, and 2.23 per cent. of water, as 17.73 per cent. of oxalate of ammonia. The 0.92 per cent. of humic acid found (sect. 19), were also contained in combination with ammonia, and with the necessary proportion of water, as 1.06 per cent. of humate of ammonia.

K. The quantity of ammonia as yet consumed (in division I. and II.), amounts together to 11.84 per cent. ; but, as according to section 10, the total quantity of ammonia consists of 12.07 per cent., the surplus of 0.23 per cent. must exist in guano in some other combination. According to section 3, there can be no doubt that carbonate of ammonia is contained in guano, the only question is, in what degree of combination ? As $\frac{2}{3}$ sesquicarbonate of ammonia by exposure to the air is converted into a bi-carbonate, this property would speak for the latter salt; but, the quick alkaline reaction of the fumes of guano indicate a very volatile combination ; and we must, therefore, assume the combination to be that of a sesquicarbonate of ammonia, the quantity of which must be reckoned at 0.80 per cent.

L. If we deduct from the loss by weight = 5.11 per cent. of section 28, the volatilized 0.80 of carbonate of ammonia, we obtain the amount of 4.31 per cent. of water.

M. That which remains after deducting the constituents found, must be reckoned as organic nitrogeneous substances soluble in water, which were not more closely analyzed, and amount to 8.26 per cent.

I annex by way of comparison, the composition of the various sorts of guano, examined by myself, Bertels, and Voelckel :

1. *Composition of Brownish-yellow Guano (according to Oellacher).*

According to			*Quantity of Ammonia.*
Section *C.*	Urate of Ammonia	12.20	1.06 per cent.
" *I.*	Oxalate of Ammonia	17.73	6.50 "
" 22.	Oxalate of Lime	1.30	
" *F.*	Phosphate of Ammonia	6.90	1.79 "
" *A.* & *E.*	Phosphate of Ammonia and Magnesia	11.63	1.68 "
" *B.*	Phosphate of Lime	20.16	
" *H.*	Muriate of Ammonia	2.25	0.72 "
" *G.*	Chloride of Sodium (common salt)	0.40	
" *K.*	Carbonate of Ammonia	0.80	0.23 "
" *B.*	Carbonate of Lime	1.65	
" 15.	Sulphate of Potash	4.00	
" *D.*	Sulphate of Soda	4.92	
" *I.*	Humate of Ammonia	1.06	0.09 "
" 27.	Substance resembling wax	0.75	
" 21.	Sand	1.68	
" *L.*	Water (hygroscopic)	4.31	
	Undefined organic matter	8.26	
		100.00	12.07 per cent.

2. *Composition of Brown-red Guano (according to Bertels).*

Muriate of Ammonia	6.500
Oxalate of Ammonia	13.351
Urate of Ammonia	3.244
Phosphate of Ammonia	6.450
Substances resembling wax and resinous matter	0.600
Sulphate of Potash	4.277
Sulphate of Soda	1.119
Phosphate of Soda	5.291
Phosphate of Ammonia and Magnesia	4.196
Common Salt	0.100
Phosphate of Lime	9.940
Oxalate of Lime	16.360
Alumina	0.104
Sand, insoluble in nitric acid, and containing iron	5.800
Loss (water and volatile ammonia, and indefinite organic matter)	22.718
	100.000

3. *Composition of Yellow Guano (according to Voelckel).*

Urate of Ammonia	9.0
Oxalate of Ammonia	10.6
Oxalate of Lime	7.0
Phosphate of Ammonia	6.0
Phosphate of Ammonia and Magnesia	2.6
Sulphate of Potash	5.5
Sulphate of Soda	3.8
Muriate of Ammonia	4.2
Phosphate of Lime	14.3
Clay and Sand	4.7
Indefinite organic substances, of which about 12 per cent. are insoluble in water; soluble salt of iron in small quantity, and water	32.3
	100.0

If we compare these three sorts of guano, we shall find that the quantity of ammonia increases as the quantity of undecomposed organic matter decreases, and it is evident that guano submitted to a perfect decomposition would consist of nothing but saline combinations.

The specimen of guano No. I, contains 52.57 per cent. of ammoniacal salts, with 12.07 per cent. of ammonia.

The specimen of guano No. II*, contains 33.74 per cent. of salts of ammonia, with 9.53 per cent. of ammonia.

The specimen of guano No. III*, contains 32.40 per cent. of ammoniacal salts, with 7.95 per cent. of ammonia.

Beside the large proportion of ammoniacal salts, and of organic nitrogenous substances, the large quantity of phosphoric acid, and the considerable proportion of fixed alkalies contained in the guano, entitle it to the high estimation in which it is held as a manure. The specimen which I examined (see Analysis No, I) contained no less than 18.42 per cent. of phosphoric acid.

As it was of great interest to examine the white grains of guano (mentioned in sect. 1) separately, in order to throw some light on the history of the formation of guano, a subject involved in much obscurity; *the purest*

* The quantity of ammonia given in the analyses of Nos. II and III, is calculated from the quantity of ammoniacal salts obtained, and is not determined by direct experiment.

white grains with a crystalline texture were subjected to a very careful examination, and I obtained the following composition :—

	Granular White Guano.
Oxalate of Ammonia	65.50
Urate of Ammonia	18.71
Phosphate of Ammonia	5.00
Oxalate of Lime	6.57
Phosphate of Lime	4.22
Phosphate of Ammonia and Magnesia	Traces.
	100.00

Beside these constituents, I have not been able to discover any others.

The properties of good guano are as follows :

1. It should possess a powerful odour of urine.

2. 50 — 70 per cent. at least must dissolve in a hot solution of caustic potash, with the developement of a powerful odour of ammonia.

3. Muriatic acid, added in slight excess to this filtered solution, must produce a copious brown crystalline precipitate of uric acid.

4. On exposure to heat it should leave an ash, soluble (all but a slight residue) in an excess of muriatic acid. If to this acid solution caustic ammonia be now added in slight excess,

5. A white gelatinous precipitate should ensue ; which, on being dried and submitted to heat, amounts to at least 15 — 25 per cent. of the weight of guano used.

THE ACTON PRIZE.

Some years ago, the sum of one thousand pounds was left by Mrs. Acton, of Euston Square, under such regulations, that once in seven years a prize of one hundred guineas should be awarded by the Committee of Management of the Royal Institution, to the author of the best Essay "Illustrative of the Wisdom and Beneficence of the Almighty in such department of Science as the said Committee of Managers for the time being of the said Institution shall in their discretion select."

The first adjudication of this prize took place on the 16th of April. The subject proposed was "Chemistry as exemplifying the Wisdom and Beneficence of God."

The prize was awarded to Mr. Fownes, Professor of Chemistry to the Pharmaceutical Society.

BROCKEDON'S PATENT PROCESS.

We have received a specimen of bi-carbonate of potash compressed into the form of a pill by a process invented by Mr. Brockedon, and for which he has taken out a patent. We understand the process is applicable to the compression of a variety of other substances into a solid mass, without the intervention of gum or other adhesive material. Mr. Brockedon has promised to favour us with a detailed account of this process for publication in an early number.

TO CORRESPONDENTS.

Several Articles which are in type, and which we had intended to publish this Month, are unavoidably deferred for want of space.

"A Bristol Member."—The letter arrived too late for last month. The analysis of organic substances requires many precautions and much nicety of manipulation, which it would be impossible to describe in the space we could give the subject. Some useful information may be derived from *Parnell's Chemical Analysis*.

"One of the Old School."—The compounds sold as artificial manure, consist chiefly of sulphate of ammonia, to which sometimes bone-dust is added, with some other ingredients, to disguise the composition. See the article on Guano in this number, page 550.

"A Student" (1) confounds cardamom *fruit* with cardamom *seed*. The husk is no part of the seed although it encloses it, and the two together constitute the fruit.—(2.) In speaking of the produce of essential oil from any flower or seed, *commercially, avoirdupois* weight is generally used to designate the quantity.

M. S. H.—Tinct. Secalis Cornuti:—Secalis, ℥ij.—Sp. V. ten. Oj.

"Inquisitor."—(1.) The evaporation of infusions during maceration is so small as to be quite unimportant.—(2.) Tinctures ought not to be allowed to macerate longer than the time ordered.

J. H. wishes for a formula for ginger-beer without fermentation or a machine.

W. R. F. complains, that we have not answered a question which he sent us about two months ago. The question has been so amply and repeatedly answered in various numbers of this Journal, and also in *The Historical Introduction*, that we think it unnecessary to do more than refer to our former numbers, especially vol. ii., pages 613—618.

Mr. Setchfield.—No.

G. A.—We believe the manufacturers clear glue by boiling and straining. A little alum is generally added.

"A Member" suggests the propriety of petitioning Parliament for a reduction of the Patent Medicine Licence; and inquires, whether the periodicals at the Library of the Pharmaceutical Society may be taken away from the house by those who reside at a distance? [The removal of the books is not allowed, the Library not being at present a circulating one.]

E. J.—(1.) Associates are admitted to the Library, at 17, Bloomsbury Square.—(2.) Associates admitted before July 1, 1842, have the option of passing the major examination, or not, when they become members.

"Studiosus."—The fee to be paid on passing the major examination is ten guineas, which is payable when the candidate receives his certificate or diploma.

"℥iis."—An Apprentice may subscribe to the Society as a student or apprentice, after having passed merely the classical examination. To become an Associate, it is necessary to pass the minor examination in Pharmacy, Chemistry, &c. See Vol. II., No. 8.

Mr. Raw, in illustration of the danger of incompetent persons undertaking to prepare prescriptions, encloses a label taken from a bottle of mixture prepared by a *grocer*, which is as follows: "Two tablespoonfuls to be taken three times during for."

"Civibus" wishes to have a formula for Copying Ink—we believe the following is a good one:—Gum Arabic, 240 grains—Spanish Liquorice, 20 grains—Water, 720 grains. Dissolve and boil for five minutes, adding as much water as is lost by evaporation. Then take of the best lamp black 60grs. Add a teaspoonful of white wine, and stir in two teaspoonfuls of the above gum water in a glass or Wedgwood mortar. Rub it well, adding the remainder of the gum water gradually. It should be rubbed for about an hour. Then strain it through muslin and keep it in a bottle well corked.

F. R.—1. We have heard of isinglass being adulterated with cut bladder, but the fraud most frequently committed consists in mixing inferior isinglass with that of better quality.—(2.) There is no solid bi-carbonate of magnesia. The solution of carbonate of magnesia with excess of carbonic acid, is, by some persons, considered a bi-carbonate. — (3.) The sesquicarbonate of soda of commerce, as usually met with, is a bi-carbonate of soda; but it sometimes contains a portion of carbonate.

T. B. M.—The Pharmacopœia directs the maceration of *Infusum Lini Compositum* to take place *near the fire.* In the case of the other infusions this is not specified, we may therefore infer that it is not intended.

"Pharmacien" inquires, where he can find an account of "Dammara gum, or resin, and its uses." [There is a slight notice of this substance in *Christison's Dispensatory*, and in the *United States Dispensatory*, but a more full account, including it uses, will be found in *O'Shaughnessy's Bengal Dispensatory*, pp. 221 and 617.

A. P. S. (Manchester).—(1.) The reason why chloride of nitrogen, in exploding, breaks vessels of iron, but not of lead? [Because iron is brittle, and lead is not].—(2.) Why does not an alkaline carbonate precipitate carbonate of iron from solutions of peroxide? [Because there is no carbonate of peroxide of iron.—(3.) The composition of citraconic acid, according to Liebig, is $C_5 H_2 O_3 + HO$. It is one of the products of the action of heat on citric acid.

Printers' Ink.—In answer to X. Y. Z. in our last number, we have received the following formula from T. B.:—Take of Copaiba, 9 lbs.—Fine Lamp Black, 4 lbs.—Indigo, 1 lb.—Dry Yellow Soap, 3 lbs.—To be ground perfectly smooth. And the following from "Socius": (1.) Take of Copaiba, ℥viij.—Lamp Black, ℥iij.—Prussian Blue, ℥iss.—Indian Red, ℥vj. Yellow Soap (dried), ℥iij. Ground on a slab with a muller until perfectly smooth.—(2.) Gray's natural arrangement of Plants was never adopted by any botanist of repute. We have not seen the other work named by our Correspondent. The words on the diploma are at present not altered.

"Amicus" and several other Correspondents wish to know the proportions to be used in making Blue Ink. Take of Prussian Blue, ℥vj.—Oxalic Acid, ℥j. Rub these together with a small quantity of water, then add, Gum Arabic, ℥iij.—Water to make ℥viij.

A. Thompson (Carlisle), is desirous of being informed how to detect the presence of sulphate of lime in flour. [Calcine a portion of the suspected flour in an *open shallow* crucible at a red heat, stirring it until all carbonacious matter has been burned away. If sulphate of lime was present it will remain in the crucible. Dissolve a portion of this residue in distilled water, and filter the solution. Test the clear liquor with oxalate of ammonia for lime, and with chloride of barium for sulphuric acid].

Mr. S. R. Dawe (Swansea), has sent us a sample of unguentum hydrargyri nitratis of good colour and consistence, informing us that it was prepared on the 3d of February, exactly according to the Pharmacopœia, the quantity of acid being adjusted according to its density. The acid was added to the lard and oil at a temperature of 185° Fahr., and the ointment was stirred until cold.

D. L. (Horncastle).—Graham's *Elements of Chemistry* (Bailliére).

M. E. (1). inquires how to obtain the impression of green leaves on paper by a solution of bi-chromate of potash?—(2). The best method of preparing photographic paper?—(3). The concentrated solution of nitrate of mercury, alluded to in vol. iii, page 42, is made by dissolving mercury in strong nitric acid to saturation with the aid of heat.

X. Y. Z.—(1.) The price of the work is 6*s.*—(2.) It is not customary to add the prices of Works in reviews.—(3.) X. Y. Z. desires a formula for Manganese Ink, or any other kind which will not corrode steel pens.

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

THE PHARMACEUTICAL JOURNAL.

VOL. III.—No. XII.—JUNE 1st, 1844.

VETERINARY PHARMACY.

It was formerly supposed that most medicines had a similar effect on horses which they were found to exert on the human subject; and on this account many remedies which are now exploded in veterinary practice, were empirically administered by persons who, for want of education, were unable to distinguish the useful from the inert. Peculiar virtues were also superstitiously attributed to various substances, on account of their form, colour, and other arbitrary qualities. Mr. Bracy Clark, alluding to the rash and empirical practice of uneducated Farriers, observes (in the introduction to his *Pharmacopœia Equina*), "Where there is a violent disease, a violent remedy, say they, must be administered; and to give a strong drink, there must be something strong in it—and what is there so strong as oil of vitriol? By such logic as this I have no doubt thousands have come to their death." Mr. Clark proceeds to give a few illustrations of the frequent employment of this "remedy," both outwardly and inwardly, in cases where it could not fail to do much mischief. The following is his description of the "Pharmacy" of the class of empirics among whom he finds so much need for reformation: "A stone jar of raw oil of vitriol, another of spirits of turpentine, a bottle containing corrosive sublimate, and another butter of antimony—all unlabelled! an assemblage of greasy broken pots, a filthy ladle for boiling tar, and some tow: to this motley list is commonly added a bottle of oil of aniseed, to serve on all occasions to convey by the smell a delusive notion of the nature of their compounds. * * * A plough-boy, seeking work, enters a forge, and in twelve months' time, by their system, becomes, by the use of this dingy cupboard, a conceited physician of the horse!" Whatever foundation there might have been for these remarks at the time they were published (about twenty years ago), the exertions of the author, as well as

other leading members of his profession, have so far produced a revolution, that the *total* ignorance which formerly almost constituted the rule, may now be considered the exception; and although much remains to be done, the Veterinary Surgeons of the present day are a very superior class of men to their predecessors.

Mr. Bracy Clark, in the work above mentioned, directs particular attention to the fact, that many remedies in constant use for the human subject, have a very different action, or, in some cases, no apparent action whatever on the horse. Among the purgatives, he enumerates jalap, elaterium, gamboge, and colocynth, as producing no laxative effects on the horse, although administered to such an extent as to occasion the death of the animal. Similar facts are stated with respect to emetics, which have quite a different action on horses. This might be anticipated from the fact, that the physiological conformation of the horse prevents vomiting altogether. Mr. Clark extends these remarks to narcotics; but on this head the facts noted require to be confirmed by further statistical evidence.

The subject is one which demands serious attention and careful researches; and it constitutes, perhaps, the most interesting portion of Mr. Clark's *Pharmacopœia Equina*, a work which has enjoyed more celebrity in France and Germany than in England. In fact, so much was it esteemed in those countries, that the publishers, although they translated it at their own expense, and without the assistance of the author, voluntarily sent him a portion of the profits, to which they considered him entitled.

The services which Mr. Bracy Clark has rendered, have not been duly appreciated by his professional brethren in this country, which may in some degree be accounted for by the fact, that the exposure of abuses, and the publication of criticisms on ignorance, naturally entail upon those who undertake so invidious a task, a certain amount of opposition, or even enmity, from the class of persons implicated. But while Mr. Clark, in his determination to give no quarter to the Farriers, whose ignorance he assailed, obtained, as might have been expected, no assistance or co-operation from them, his efforts have been seconded by others of his own

standing, who, without uniting in his scheme, have been labourers in the same cause, and have assisted in bringing about the reformation which he desired.

So long as veterinary practice was to a great extent in the hands of the Smiths and Farriers, no progress in the pharmacy of the stable could be expected, and the obloquy which was cast upon the craft generally, in consequence of the degraded state of a majority of those who followed it, tended to continue the evil by deterring a superior class from embarking in the pursuit. But in proportion as *Veterinary Surgeons* increased, and became altogether disconnected and distinguished from the illiterate empirics of the forge, the respectability and education of what might properly be termed the profession, improved as a natural consequence. The permanent establishment of the body by Royal Charter, may be considered a death-blow to the abuses which formerly degraded the veterinary art.

Among the publications which have tended to promote this advancement by spreading useful information, we may notice the *Veterinarian*, which was commenced in 1828, by Mr. Percivall and Mr. Youatt. The work, which during some years was conducted by Mr. Youatt alone, has continued to flourish up to the present time, and is now under the auspices of Messrs. Youatt and Percivall, assisted by Professor Dick, Mr. Karkeek, and M. Leblanc.

The *Veterinarian* is intended to supply the place in the veterinary department which is occupied by the *Lancet* or *Medical Gazette* in the medical profession, and it contains a variety of cases, lectures, miscellaneous facts, and information interesting to those who are engaged in the treatment of cattle.

The transactions of the Veterinary Medical Association, which had previously formed a portion of the *Veterinarian*, were, in the year 1841, placed on a distinct footing, and have since that period been published separately, under the superintendence of Professor Morton. Notwithstanding this circumstance, the *Veterinarian* maintains its ground, and the fact that two periodicals of this

description are so well supported, is a sufficient proof of the advancement of education in the profession.

There is one deficiency in both these periodicals, which we hope in process of time to see in some degree supplied—we allude to the absence of any definite information on subjects strictly pharmaceutical: the matter being in general on medical and surgical subjects, and relating but little, if at all, to the nature and preparation of the remedies.

The *Manual of Pharmacy*, by Professor Morton, the third edition of which appeared at the close of last year, is a very useful and practical work. It contains in a small compass the most important information which the author has been able to collect from the best authorities on the subject. In its plan it resembles a Pharmacopœia, and the arrangement being alphabetical, is convenient for reference. It contains a table of the doses of simple medicines, formulæ for the preparations most commonly required, a concise account of the chemical composition, properties, and uses, tests of purity, and precautions to be observed in the employment of the several remedies enumerated, and is calculated to be essentially useful to every Chemist and Druggist who devotes any attention to the preparation and sale of horse medicines.

We are aware that the sale of horse medicines is, by some persons, considered to be beneath the dignity of the Pharmaceutical Chemist. This is a prejudice which is at variance with common sense. It is the business of the Chemist and Druggist to prepare and supply medicines of all kinds, and for every purpose. The treatment of disease, whether in man or in the lower animals, requires the same amount and a similar description of skill; and success is in both cases dependent to the same extent upon the quality of the remedies. The Chemist cannot be expected to undertake the cure—he is no more qualified for this office than he is for other medical practice; but he is the proper person to furnish the materials, and he ought to make himself acquainted with their properties, doses, and effects.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

THE INTRODUCTORY LECTURE ON BOTANY,

BY DR. A. T. THOMSON.

Delivered at 17, *Bloomsbury Square, on Wednesday Evening, April* 24*th.*

Dr. Thomson commenced by observing, that in presenting himself for the third time before the Members and Associates of the Pharmaceutical Society, as their lecturer on Botany, he felt encouraged by the conviction that the views of the Society, in reference to education, were not circumscribed within the narrow limits of mere practical utility, but were sufficiently extended to embrace science, for the results which the study of its various branches is certain to produce on the intellectual faculties of its pupils. "If wealth and distinction in society," he continued, "be worth the labour bestowed upon their acquisition, how greatly must their value be enhanced when they are adorned by the gifts of the mind! for whilst we must admit that science is dignified by the light which it sheds upon the arts of life, yet we should never place out of view the exercise which it affords in training the mind to thought; in rendering more acute and accurate the powers of observation; and, instead of diminishing the capacity for the performance of the ordinary duties of life, rendering these more easy. In the pursuits of science, a new source of pleasurable gratification, also, is opened to soothe and refresh the inquirer, after the monotonous labours of his every-day occupations. Wherever he directs his steps, something of interest calls forth his admiration, and every part of creation displays to him unequivocal evidences of matchless skill and beneficent design. Were Botany, therefore, valuable only as a branch of science well calculated to exercise the mental energies, it would be worthy of the student; for, as I stated on a former occasion, it is not essential in the endeavour to determine the laws, and detect the causes of phenomena, that they should be such only as have a decided application to the wants, or which tend to administer to the luxuries of our species. With the conviction that those whom I have now the honour to address will accord in this sentiment, I shall not attempt to offer any arguments in support of the utility of Botany to the Pharmacopolist, regarding it as a truism which requires no reasoning to uphold; for assuredly it

would be absurd to deny that any one whose occupations demand that he should be acquainted with plants, will not be greatly benefited by the study of the science which teaches their *structure* and *functions*, the influence of *external* agents on their *growth* and *productions;* and which points out the means of *recognising* and *distinguishing* them from one another.

"The quality of every vegetable production is influenced and materially modified by many external circumstances, such, for example, as constitute the diversities of climate; namely, temperature, humidity, atmospheric pressure, and intensity of light, as well as diversity of soil. It is upon the presence, or the variations, or the absence of these, in a greater or less degree, that plants thrive in one quarter of the globe and cannot live in another; and which, consequently, force us to send to distant countries for many medicinal substances, and the raw material essential for the labours of the artist and the manufacturer. Thus, we bring our Cinchona bark from Peru, our Rhubarb from China, Cinnamon from Ceylon, the Nutmeg from the Molucca Islands, and Asafœtida, Ammoniacum, and Opium from Persia. We cannot cultivate the plants which yield them in this climate. It may, nevertheless, be a question involving the interests of millions of human beings, whether some plants cannot be naturalized to other parts of the globe than those on which nature has placed them. This is a question to which the philosophical Botanist only can give a safe and satisfactory reply; and if it be in the affirmative, it is only upon his knowledge that any reliance can be placed for the adoption of the proper measures to insure the success of the experiment. He must be resorted to, also, for information respecting the laws of nature which regulate the growth, and improve the properties of plants indigenous to his own country; as, for example, in the great national object of timber, and the various productions of gardening and husbandry.

"Circumstances, even, have occurred in which a knowledge of Botany would have most beneficially influenced the political happiness of Europe. In 1500 and 1503, great consternation was spread over this island and the whole of the continent, by the appearance of various colours, especially red, on clothes, the veils and neckkerchiefs of women, on various household utensils, on the meat in larders, and on the roofs of houses. These were termed 'blood-spots;' and the feelings of superstition which then prevailed, led many to recognise in them the form of the cross. The depression of spirits which this phenomenon occasioned, and the great dampness of the atmosphere that prevailed, led to the production of low fever, which raged so extensively as a pestilence, that the inhabitants of the towns and villages fled to the woods, leaving their habitations so desolate,

that even the house-dogs became wild. Now, these spots were merely cryptogamic plants, more than usually developed by the great moisture of the atmosphere; and had their nature been understood, they were not at all calculated to excite superstitious dread, nor to be regarded as something miraculous.

"Similar cryptogamia are frequently observed in Egypt, Arabia, and Siberia, and have been examined and traced to their origin by Ehrenberg, a distinguished German botanist. So late also, as 1819, a red or bloody mould, a species of Mycoderma, adhered to vegetable and animal substances in the province of Padua, and again excited superstitious apprehensions among the people; but these were soon subdued by the light of science. The contrast is striking. In the first instance, the superstitions engendered by the ignorance of the nature of the blood spots, set up fever, and rendered the ravages of the disease more extensive, and the mortality greater than it otherwise would have been: in the second, such an event was prevented.

"It is now well ascertained that these mould spots, or fungi, are propagated by germs, which may remain inert, although possessing the capacity of living, until circumstances occur favourable to their germination, when the plants are rapidly developed. The minuteness of these cryptogamic plants affords no argument against their production by germs, since we know that some of the polygastric infusoria, are $\frac{1}{2000}$ of a line only in diameter, yet, they have a complicated stomach, organs of motion, and glands, and are propagated by ova.

"To a similar origin as the blood-spots has been traced the red snow seen by Captain John Ross in Baffin's Bay, which excited not more the wonder of the ignorant than the attention of the most eminent Botanists and Chemists who examined the specimens brought home by Captain Ross. It was finally ascertained to be a species of Protococcus, a plant belonging to the cryptogamic Algæ; and it has been described by Professor Agaroth and Dr. Greville under the name Protococcus *nivalis*. These facts sufficiently demonstrate how readily the clouds which obscure truth are dispersed before the light of science; and how far the investigations of the Botanist may contribute to explain phenomena which, without his aid, have filled kingdoms with alarm.

"But the investigations of scientific Botany extend their advantages still farther than enabling us, under such circumstances, to combat successfully the tyranny of superstition—they even tend to confirm our religious faith. I shall mention one instance only in support of this opinion. None of the events recorded in the sacred volume is more striking than the universal deluge; but although the existence of such an awful catastrophe has never been seriously denied, yet arguments have been brought

forward against its universality, and the consequent destruction of all the races of both vegetables and animals, except those saved with Noah, which then covered the globe. Now, Botany enables us to examine the vegetable remains imbedded in the crust of the earth by that event, and by tracing the structural differences between the existing and the extinct races, it demonstrates the fact that many genera and species of plants which then existed are now completely extinct. In the coal and other strata, for example, species of genera which no longer exist, are constantly discovered. Nothing more can, therefore, be required to prove the general nature of the Deluge, for it is only when all the individuals of a species and all the species of a genus are destroyed, that the genus becomes extinct; and, consequently, the confirmation thus afforded of an event which could only occur by the intermediate, miraculous interposition of the Deity, must tend to silence the objections which scepticism is ever eager to urge against the truth of Scripture history, by advancing arguments to prove the impossibility of the occurrence of many of the preternatural events recorded in that sacred volume.

"With respect to the mode of studying Botany, I must repeat what I formerly stated, 'that the student ought not to rest satisfied with the information which he receives from the lecturer, or from the perusal of books; he must make his appeal to nature, and pursue his inquiries until he has convinced himself, through her means, of the truth and accuracy of the statements to which he has listened, or of the accounts which he has perused.' But although it is easy to recommend such a plan of study, yet it is too often not in the power of the student to follow it, however anxious he may be to do so. His inability to command the means of making such an appeal, and the disadvantages which the obstacle thus raised to his advancement in the study occasions, cools his enthusiasm, and so relaxes his energies, that he despairs of understanding the subject, and at length reasons himself into the belief that it is not essential to his pursuits, and, like many of those who have gone before him, he may do very well without it:—a fatal error, the effects of which will become more and more obvious to him at every stage of his progress through life, and which it will be extremely difficult, if it be not impossible to counteract, when his time is fully occupied with the bustle and turmoil of an active professional career. Few events of my life have given me, therefore, more satisfaction than the opportunity which has enabled me to open the gates of the Royal Botanic Garden, in the Regent's Park, to the Botanical Students of this Society. It sets aside the obstacles to which I have alluded, and it is likely to give an impulse to the exertions of the student for the attainment of Botan-

ical knowledge, that will at once dispel all his doubts respecting the importance of the acquisition.

"Plants which are brought into a class-room are generally in such a condition, that however well they may be described, and the descriptions understood by the student, they are, nevertheless, difficult to be recognised by him in their growing state. The manner in which the plant rises from the soil, the expansion of the leaves, the characters of the inflorescence, the freshness of the colour, and many other features which impress the memory with the means of recognising a growing plant, are wanting in the cut plant. By the arrangement which has been made with the Council of the Botanic Society, the student will have the means of examining the living plants—at least those which are indigenous, or can be cultivated in our climate in their growing state, of comparing them with their congeners in the same natural order; and as his examination of them may be daily repeated, their features, like those of an old acquaintance, will become familiar to him, and never be forgotten. To assist him as much as possible in this part of his studies, it is my intention to be in the garden every morning, except those in which the lectures shall be delivered in this room, to guide his observation to the leading characteristics which distinguish plants from one another—those of the classes and orders to which they belong—and lead him imperceptibly to the attainment of the principles of classification. This will greatly advance his comprehension of the instructions in systematic Botany, which are intended to be delivered in the Garden. Such is the plan of instruction which I mean to pursue in this course. If I fulfil my part of the contract, I trust that the opportunity of regular attendance shall be given to the students; and with a determination in teacher and pupil to regard the subject as one of importance, and demanding the most serious attention, there can be no difficulty in anticipating the result."

Dr. Thomson concluded his lecture with some observations on the distinction between plants and animals; an allusion to the different parts constituting a plant; and to some of the theories which have been published respecting vegetable functions, followed by a statement of the arrangement which he proposed to adopt during his ensuing course of lectures.

THIRD ANNIVERSARY

OF

THE PHARMACEUTICAL SOCIETY,

Held at 17, *Bloomsbury Square, May* 21*st*, 1844,

MR. JOHN SAVORY, VICE-PRESIDENT, IN THE CHAIR.

The Chairman expressed his deep regret at the absence of the President, who was prevented by severe indisposition from attending the meeting, and having been unexpectedly called upon to fill his place, would not attempt to enter into any detailed account of the progress of the Society, but thought it better at once to call upon the Secretary to read the

REPORT OF THE COUNCIL.

The Third Anniversary of the Society having arrived, it becomes the duty of the Council to present a Report of their proceedings during the past year.

It has been the endeavour of the Council to keep in mind the various objects contemplated in the original formation of the Society, and steadily to persevere in carrying out the plans which have been adopted for their fulfilment: their progress will be detailed under the several heads of this Report.

In prosecuting their labours, the Council have been increasingly convinced of the advantage of union and co-operation, and the claims of this Association to the support of all who are interested in the progress of Pharmacy, and in advancing the qualifications and respectability of those who practise it on so extensive a scale as do the Chemists and Druggists of this country. It cannot, indeed, be expected that a rapid succession of striking results should appear in an undertaking like the present; the development of its effects must necessarily be gradual, and these are only to be anticipated from diligent, yet patient, endeavours to consolidate the interests of the Society and extend its benefits.

The Council would impress this upon the Members, and while they wish to acknowledge the encouragement they have derived from the extended influence the Society has obtained among those (connected with it or not) who have fairly and attentively watched its objects and progress, they feel the necessity of guarding against any abatement of zeal in those of its supporters, whose expectations may have been unduly excited, or who may have been less attentive observers of its operations.

FINANCIAL REPORT.

RECEIPTS AND EXPENDITURE FROM JAN. 1st TO DEC. 31st, 1843.

Dr.

	£	s.	d.
Five Life Members 105 0 0			
Interest on Stock.. 10 18 7			
	115	18	7
Benefactions and Interest on account of Benevolent Fund	267	6	0
Interest on Druggists' Old Fund	29	6	9
Interest on General Fund....	161	8	1
Fees for Admission to Lectures	207	7	6
1618 Members 3397 16 0			
Less 18, being Associates..... 18 18 0			
	3378	18	0
Members' Entrance Fees	73	10	0
2011 Associates.....	2111	11	0
34 Registered Apprentices....	35	14	0
68 Registration Fees	18	6	6
Subscriptions for 1842	8	9	0
Rent for Chambers and Attendance.....	30	6	0
Balance due to Treasurer....	1351	15	11
	£7789	17	4

Cr.

	£	s.	d.
Balance due to Treasurer, 1842	12	4	5
Investment of Life Members' Subscriptions, and Dividend, 3 per Cent. Consols, £117 12s. Stock, at 97, cost	114	4	4
Investment on account of Benevolent Fund, 3 per Cent. Consols, £750 17s. Stock, cost	707	7	4
Investment on account of Druggists' Old Fund, 3½ per Cents., £76 14s. 7d. Stock, cost	78	15	0
Investment on account of General Fund, 3½ per Cent. Reduced, £1500 Stock, cost ..	1526	5	0
Law Expenses and Charter of Incorporation	667	19	0
Pharmaceutical Journal 1200	0	0	
Delivering ditto	93	1	2
Library	144	15	4
Museum	376	18	6
Curator and Librarian (1½ year)	145	8	4
Apparatus.....	208	11	8
Expenses of School of Pharmacy and Lectures	577	14	0
Fixtures and Fittings	222	6	3
Furniture.....	148	18	6
Advances to Branch Schools ..	221	10	0
Travelling Expenses of Country Members of Council (7 months)	20	15	6
Rent 240 0 0			
Rates and Taxes.... 115 10 5			
	355	10	5
House Expenses.	59	12	8
Secretary	150	0	0
Collector's Poundage	78	14	6
Country Commission on Remittances	10	11	8
Servants' Wages.....	136	14	0
Treasurer's Clerk (two years)..	10	10	0
Stationery.....	44	5	5
Postage	43	7	4
Advertisements	23	9	0
Printing and Engraving, including Diploma and Certificates	335	8	1
Sundry Disbursements, including Tin Cases for Diplomas..	67	13	11
Subscriptions returned.....	7	6	0
	£7789	17	4

We, the undersigned Auditors, have examined the Accounts of the PHARMACEUTICAL SOCIETY, and find them correct, agreeably with the foregoing Statement, and that there were standing in the names of the Trustees of the Society, at the Bank of England, on the 31st December, 1843,

		£	s.	d.
On Account of the General Fund	.....3½ per Cents. reduced..	5500	0	0
Benevolent Fund	.....3 per Cent. Consols....	1329	19	8
Druggists' Old Fund, New 3½ per Cents	.....	901	14	7
Life Members	.....3 per Cent. Consols....	434	3	0

JOHN HUSKISSON.
WILLIAM WILKINSON.
JOHN WATTS.
GEORGE COLK
E. N. WINSTANLEY.

April 18th, 1844.

On reference to the last Annual Report, it will be seen that the Society was under engagements to the amount of £840; these, with the expenses of the Charter, have been discharged, some special outlays have also been made, and with the necessary investments on account of the several permanent funds, and the current charges of the year, the income has been nearly absorbed. It was the wish of the Council to pay all the outstanding claims against the Society at the close of the year, and for this purpose to sell part of the property invested on the general account: this was prevented by the protracted indisposition and subsequent decease of the late lamented President, one of the trustees. The Treasurer, however, kindly advanced the requisite amount, which enabled the Council to discharge the accounts, leaving the sum of £1350, as a claim to be liquidated out of the funded property or the income of the present year. It will, nevertheless, be seen that the investments of the Society are increased, after all demands are discharged.

The Council beg to draw the attention of Members to the modification of the terms of subscription in the Bye-laws, which has been made after the most mature consideration; and though it involves an outlay in the first instance, can be shown on calculation to be advantageous to individuals, while it will tend to increase the permanent funds of the Society.

Should the desire for a further reduction of the Annual Subscription expressed by some Country Members, continue to be urged upon the Council, they think it right to repeat what they have already stated, namely, that the adoption of this measure would involve the necessity of such an alteration in the plans of the Society, as at present would curtail its usefulness, and protract the attainment of the full amount of benefit which the Institution is calculated to confer.

BENEVOLENT FUND.

The Council regret that it is not in their power to present a more favourable statement of this Fund, the appeal made at the last Annual Meeting not having been so generally responded to as they could have wished, and they again solicit such especial benefactions, however small, as Members or their friends may feel disposed to contribute. The Council recommend a vote of £500 from the General Fund to this object, and will rejoice when the annual income derived from it has become sufficient to justify the commencement of its appropriation to the objects for which it is designed.

EDUCATION.

The School of Pharmacy in London has arrived at the commencement of its third session, and the Council consider that there is every reason to feel encouraged at its success. The attendance, however, has been more limited than could have been wished, and the Council feel it their duty again to urge upon Members the necessity of encouraging their *Apprentices* and *Pupils* to avail themselves of the advantages afforded in the School. The instruction given has been judicious and appropriate, and every effort has been made to render it interesting and attractive by means of useful illustrations. No pains should be spared to establish the character of the School, and amidst the strides that are being made in Pharmacy, as well as in every other art and science, the youthful Chemist and Druggist must be stimulated by every means to the acquisition of knowledge, and the improvement of his talents—as it is to the rising generation that the Society must look for its advancement and support among the institutions of the country.

Prizes have been awarded at the close of the courses, and the Lecturers have expressed their satisfaction at the attendance and conduct of their respective classes, and the Council are desirous of extending this stimulus to exertion in the Branch Schools.

With reference to education in the country districts, the Council have to report the establishment of Branch Schools in Manchester, Norwich, Bath, and Bristol; and that steps have been taken towards the formation of one in Liverpool.

The reports from the Committees conducting these Schools give an encouraging account of the success attending their first efforts, and seem to justify the desire to increase the efficiency of their plans.

It has been the earnest desire of the Council to afford every possible facility to the Country Members and Associates for obtaining the educational advantages contemplated in the formation of the Society, but it is evident that it is only in certain districts where a concentration of labour and means is to be obtained, that any efficient school can be established and upheld; and in order to ensure uniformity of operations, it is desirable that the Branch Schools should be connected with the Parent Society, and subject to the control of its Council. Much of the detail must necessarily be left to the prudence, discretion, and zeal of the local Committees, and experience can alone guide them safely in their progress. While the Council are engaged in directing their attention to the efficiency of the Metropolitan School, which after all must extend its benefits throughout every part of the country, they feel it to be their duty to encourage the efforts of

their brethren who are anxious and willing to bring the advantage of education nearer their respective homes.

EXAMINATION.

The Council have much pleasure in reporting the progress of this essential branch of the Society's operations. Numerous Certificates of the examination of Apprentices have been transmitted from various parts of the country to the Board of Examiners for approval, and many Apprentices have undergone the classical examination in London. Most of these youths have become subscribers to the Institution, and the Board of Examiners have reported to the Council their satisfaction at the character and qualifications of the pupils who have thus entered on the business of a Chemist and Druggist. Several Certificates of examination have been granted, and the Board of Examiners have been much gratified at the attainments of some of the candidates, and are satisfied that the Examinations are indirectly producing very beneficial effects among the Assistants generally, which will in due time become evident.

LIBRARY AND MUSEUM.

Since the last Anniversary, considerable addition has been made to each of these departments. 500 volumes have been added to the Library, and of these 132 have been presented to the Society. The additions to the Museum have been still more numerous, and many rare and valuable specimens have been presented during the past year.

The Society now possesses a collection of Materia Medica comprising all the substances usually employed in medicine in this country. Many of the specimens are valuable, chiefly as matters of curiosity, but the greater part of them are adapted for lecture illustration, and for examination by Students and others desirous of observing and studying the characters of these substances in the different states in which they are presented to view.

The cabinets which are designed to contain the Materia Medica of the London Pharmacopœia, arranged in drawers, so that Students may be able closely to examine and to handle the specimens, will add greatly to the facilities which the Museum will afford for the study of this branch of knowledge.

The Museum, by additions made in the present year, has now assumed a degree of completeness which cannot fail to render it not only an important feature in the Institution, but a valuable auxiliary to other means for promoting the education and qualification of the Members and Associates.

The number of visitors to the Library and Museum appears to be gradually increasing.

The Council are of opinion that the formation of a Chemical and Pharmaceutical Laboratory for practical purposes, under the direction of competent teachers, would be very advantageous, particularly for such students as have time at their disposal. The Council, however, have considered it more desirable to forward and complete, *in the first instance*, the elementary educational parts of their School.

EVENING MEETINGS AND LECTURES.

These have continued to be well attended, and the Council believe that the subjects selected, and the matter introduced, have been generally interesting and instructive. It is very desirable to keep up these meetings with spirit, as an agreeable and useful means of diffusing mutual information, and keeping the Members together; and the Council again suggest to the consideration of their Country Members, the advantage of periodical meetings for similar purposes, on a scale commensurate with their numerical strength.

TRANSACTIONS.

The principal proceedings of the Society are reported in the Transactions from time to time, and are printed in the PHARMACEUTICAL JOURNAL, which continues to be circulated gratuitously to the Members and Associates, who by this means are made acquainted with the most recent information connected with Pharmaceutical science, and the general interests of the Drug trade.

BYE-LAWS.

These are now in the hands of Members generally; and the Council hope that they will meet with approbation. It has been a work of no small labour and difficulty to frame such Bye-laws as are applicable to the nature and requirements of the Society; and the Council trust that the result of these exertions will be found calculated to facilitate the regular business of the Institution, and to ensure the orderly administration and government of its affairs.

CONCLUDING REMARKS.

The Council had confidently expected that before this time the Secretary of State would have introduced his Medical Bill to Parliament; this not having been done, it has been impossible to obtain any correct and detailed information respecting the provisions intended; nor has it yet been deemed expedient to take any active steps for maintaining the interests of qualified Chemists and Druggists by parliamentary enactment. As soon as the nature of the Government measure is made public, it will be the duty of the Council to give it their most mature consideration, and to adopt whatever course may appear most

conducive to the welfare of their constituents, to whose influence they must appeal for support in case of need.

In the mean time the Council would observe, that the surest way to promote the influence, and to preserve the privileges of the Trade, is to raise the character and qualifications of its Members, to abstain from interfering with other medical bodies, and quietly yet firmly to cultivate the improvement, and uphold the well-being of their own department in the profession.

On reviewing the progress of the Society during the last year, the Council consider it to be encouraging. The charm of novelty having ceased, and the fear of interference from without having partially subsided, it was quite natural to expect that some supporters should withdraw, as it requires a degree of public spirit to uphold a Society from which no immediate and very evident *personal* benefit is received, however great may be its prospective advantages. The Council are assured that the Society is looked upon with satisfaction by many who in the first instance doubted its usefulness, if not its intent; they know that its operations are exerting an influence in improving the quality of medicines, and the attainments of those engaged in preparing them: and it has become a bond of union, means of defence, and medium of friendly intercourse amongst a previously scattered body of men, who are now a recognised part of the medical profession. So far the end of its original formation is attained, and the Council commend it to their brethren as a work which is worthy of their continued and energetic support, involving as it does the welfare of the public, upon whose patronage and confidence they are all dependent for success.

Mr. Toswill moved the first resolution, namely, "That the Report be received and printed in the Transactions of the Society."

He considered the report to be satisfactory in every respect. It embraced so many subjects, and gave evidence of so much labour on the part of the executive of the Society, that the Members generally ought to feel greatly indebted to the Council for the great sacrifice of valuable time which they must have made in order to accomplish so much within so short a period. That the Council enjoyed the confidence of the Members, was, he thought, proved by the fact that there would not be on that occasion a contested election, since, had any objection existed, every Member enjoyed the privilege of proposing fresh names. It was encouraging to observe that the union which had taken place among the Members appeared to be cemented by time, and that the jealousy which previously existed, appeared to have merged into a desire for the common welfare. He hoped this

union would continue, and thought that it ought to be based, not on considerations of a pecuniary nature, but on respect for moral and scientific worth. The substantial advantages of the Society, which became every day more apparent, were a more enduring foundation than the attraction of mere novelty, the nature of which was transient. He considered education to be one of the most important objects of the institution, and having attended many of the lectures himself, he could bear testimony to the judicious arrangements of the Council in providing illustrations, the talent displayed by the professors, and the attention of the classes. He hoped that masters would become increasingly alive to the duty of encouraging not only their Apprentices, but if possible their Assistants to attend the lectures, and he anticipated the time when Apprentices would regularly appropriate the last year of their term to the acquirement of scientific knowledge, and would repair to the School of Pharmacy in London for that purpose. The establishment of a Laboratory was greatly to be desired, as a means of facilitating this education. In conclusion, Mr. Tosswill congratulated the Society on the progress which had been made in the completion of the Library and Museum.

Mr. Macfarlane (of Edinburgh) seconded the resolution. He had but little to add to the remarks of the last speaker, but some of the topics, especially with reference to education, might be enlarged upon. He thought one of the greatest advantages of the Society consisted in the means which it afforded of obtaining an acquaintance with the nature and qualities of drugs. It had previously been a cause of frequent complaint, that those engaged in furnishing the public with medicines, were too often unable to distinguish the quality of the substances which passed through their hands—a circumstance which entailed much injury on the medical profession, as it was often observed by medical men, that remedies reported to be efficacious, produced, in their practice, but little effect, on account of defects in the quality, which neither prescriber nor dispenser was in a position to detect. The extension of Pharmaceutical education, by removing this evil, would materially benefit not only the whole medical profession, but also the public at large. The medical men in Edinburgh were so sensible of the importance of the study of Pharmacy, that they had lately established a museum of Materia Medica; and he had been much gratified by observing the perfection to which the museum of the Pharmaceutical Society had been brought, containing as it did some of the most choice and magnificent specimens which he had ever seen. He was glad to find that the Council had turned their attention to the encouragement of provincial schools; and hoped that they would persevere in this

object. In Edinburgh but little had been done in this respect—in fact, it had been noticed that the support the Society had received in Edinburgh was not so great as might have been expected; which he could explain by the circumstance, that in that city the number of pure Chemists and Druggists, eligible as members, was comparatively small; and the means of education in every branch of the profession being very complete, there was but little scope for any new establishment of this description.

The resolution was carried unanimously.

Mr. YARD moved that the sum of £500 be invested in the names of the Trustees of the Benevolent Fund.

Mr. PEDLAR seconded the resolution. He regretted that so little progress had been made in this object since last year, and considered this the only portion of the report which did not admit of congratulation. Most other societies boast of their thousands or tens of thousands, while the Pharmaceutical Society possesses as a Benevolent Fund only a few hundreds; and unless some great exertions were made, it would be many years before this Fund would become at all available. He hoped it would claim fresh support, and realize the expectations with which it was instituted.

The resolution was carried unanimously.

Mr. SWIRE moved "That the thanks of this meeting be given to the Council and Officers of the Society, both in town and country, for their services during the past year."

Mr. DAVIS seconded the resolution, which was carried unanimously.

Mr. PIGEON, on behalf of the Council, acknowledged the vote, observing that the expression of confidence and good opinion which had just passed, was the only reward which the Council desired for their labours, besides the consciousness of having performed their duty. He trusted that it would always be the anxious desire of the Council to maintain the good opinion of their constituents by supporting the interests of the Society, and assiduously performing the responsible duties which they had undertaken.

The CHAIRMAN having inquired whether any Member wished to make any further observations,

Mr. ALFRED PAYNE, of Colchester, said he should be glad to make a few remarks on education in provincial districts. At Colchester, an association had existed for some years, and it had tended to promote harmony among the members, who met once in three months to discuss any subjects which might relate to their mutual interests, and to transact the regular business of the institution. They had a library containing between sixty and seventy standard works, which were circulated among the

subscribers, and were industriously read by the young men, whose improvement was very much promoted by this means. He suggested, in reference to the Society in general, that the metropolitan establishment having been brought to a certain degree of perfection, some assistance might advantageously be granted by the Council to provincial towns in which a commencement had been made. The members in Colchester subscribed a guinea each to the association, and which was independent of their subscriptions as Members of the Pharmaceutical Society.

Mr. Lescher thought Mr. Payne was probably not aware that this subject had already engaged the attention of the Council, and that he had overlooked the fact stated in the report, that grants amounting to £221 10*s.* had already been made for this purpose during the past year. He had no doubt that the Council would, if applied to, very readily co-operate with the Members at Colchester.

Mr. Morson wished it to be understood, that this was a case in which the Council would consider it their duty to come forward in aid of the Country Members. It was not the business of the Council to found provincial schools; it would be impossible for them at a distance to adopt the preliminary measures. But when the foundation had been laid—when the work had been brought to a certain state of completion, and a little further assistance was required, the Council would gladly contribute whatever might be in their power. In promoting education in the provinces, it was not generally necessary or even possible to establish Schools of Pharmacy, to give courses of lectures. This could only be effected in large and populous districts, and in a limited number of cases; but other means might be resorted to for instructing the students, and he thought the course adopted at Colchester very judicious. In every town in which there was a sufficient number of members to form a circulating library, great benefit would arise from this proceeding, which the Council would, in all cases, be glad to promote.

Mr. Herring confirmed what had been stated by Mr. Morson, and was very glad to see an increasing disposition to promote education, and a general acquaintance with the qualities of drugs.

Mr. Bartlett thought much credit was due to the Members at Colchester for what they had done. Infant-schools were the stepping-stones to colleges; and the provincial associations would prepare pupils for the London school, and enable them, when prosecuting their final studies, to derive additional benefit. He hoped that the Members in other places would follow the example of their brethren at Colchester.

The CHAIRMAN stated that the next business consisted in the election of Council and Auditors for the ensuing year. As only five new names had been proposed on the Council, which supplied the vacancies caused by resignations, the entire list consisted of twenty-one names, the number to be elected; consequently there would be no contest. He then read the names of the candidates, who were unanimously elected.

A vote of thanks to the Chairman was moved, seconded, and unanimously carried; which having been acknowledged by the Chairman, he dissolved the meeting.

ORIGINAL AND EXTRACTED ARTICLES.

ON THE SESQUIOXIDE AND PROTOCARBONATE OF IRON.

BY MR. RICHARD PHILLIPS, JUN.

THE protocarbonate of iron is, I believe, principally used for the preparation of the saccharine carbonate of iron, a formula for which is however given only in the Edinburgh Pharmacopœia. Dr. Christison states in his *Dispensatory*, that Dr. Clark first introduced this excellent medicine, and that Klauer, a German Chemist, discovered that the presence of the sugar prevented the further oxidation of the iron, its action in this respect being analogous in the syrup of the iodide of iron.

The directions of the Edinburgh College are, that the carbonate of soda and protosulphate of iron are to be dissolved separately in cold water, the solutions mixed, and the precipitate to be washed, by decantation, with cold water; it is then to be squeezed in a linen cloth, mixed with the requisite quantity of powdered sugar, and dried at a temperature of about 120°.

In some experiments made by my father some years ago, which I have repeated, he found that if the precipitated protocarbonate was washed with cold water, on hot water being added to the clear liquor, a protocarbonate was again precipitated, and that the original precipitate contained but little carbonic acid; in fact, that the carbonic acid present had held in solution the protoxide of iron which the cold water had washed away. The hot water to a certain extent by expelling part of the carbonic acid destroying this power, the precipitate is best washed with it. I have also found that less oxidation and loss of the protocarbonate

takes place if, instead of its being squeezed in a cloth and the sugar then added, the sugar is first made into a thick syrup, and evaporated gently with the washed precipitate: by this plan, also, a more complete mixture of the two is formed.

For the preparation of the sesquioxide of iron, the London College order that a protoxide of iron be formed in the manner last described, which, during the operations of washing and drying, loses carbonic acid and gains oxygen. Now, although if this experiment be made on a small scale this effect takes place, still the manufactured article often contains carbonic acid and protoxide, on account of its not having been properly exposed to the air whilst washing and drying. It has been proposed to substitute for this process one of Professor Faraday's, namely, that of fusing together common salt and protosulphate of iron. I have found however, that in order to make a perfect decomposition, it is necessary to keep the mixture at a great heat for a long time, and that the sesquioxide of iron remaining is in a state of aggregation similar to that in which it exists in the *micaceous* iron ore; and not being easily soluble in acids, it would be with difficulty acted upon in the stomach.

Neither of the processes, however, furnish us with a means of procuring hydrated sesquioxide of iron, and in this state it is now often required as an antidote for arsenic, and for the preparation of the citrates of iron, and for these purposes it is necessary to have an easily soluble sesquioxide. As in the case of the saccharine carbonate of iron, this preparation is only as yet introduced into the Edinburgh Pharmacopœia. It is there ordered to be formed with sulphate of iron, sulphuric and nitric acids, and liquid ammonia. Although by these means a good sesquioxide is obtained, the method is tedious and expensive. The *Philosophical Magazine* for October last contains a paper from the *Journal de Pharmacie*, on the use of chlorate of potash as an oxidizing substance; and having in the course of some experiments found that it most easily converted protoxide of iron into sesquioxide, it occurred to me that, on account of the number of atoms of oxygen it contained, it would furnish an easy and cheap method for the preparation of the hydrated sesquioxide. Twelve atoms or 1668 parts of protosulphate of iron, and twelve atoms or 1728 parts of crystallized carbonate of soda, were dissolved separately in boiling water; the solutions were mixed whilst warm, and the mixture boiled; whilst boiling, one atom or 124 parts of chlorate of potash previously dissolved, were added. The six atoms of oxygen it contained, united with the twelve atoms of protoxide precipitated, and a perfectly pure sesquioxide of iron remained, which I found when washed to be readily soluble in acids.

When dried at 212, the peroxide appears to form a definite hydrate of a brownish-orange colour, consisting of one atom or nine parts of water, combined with one atom or forty parts of peroxide; my experiments giving eighteen parts of water, and calculation 18.4 in 100.

Craig's Court, 10th May.

ROYAL MEDICO-BOTANICAL SOCIETY.

HYOSCYAMUS NIGER.

At a meeting of this Society, held January 11th, 1844, a communication, by Dr. Houlton, on the Hyoscyamus niger was read.

The author commenced by alluding to the difficulties with which the study of Botany is surrounded, and the numerous errors contained in works on the vegetable Materia Medica, owing to the fact, that the time, labour, and expense required to verify the descriptions of plants by personal observation are more than one individual can give, and he quotes De Candolle to show the sad state of descriptive Botany. That celebrated writer says, that probably not one-half of the *known species* of plants have been described from the living specimens; that hardly a quarter of them have been sufficiently verified, and that there is scarcely a hundredth part about which one might not reasonably doubt whether they are species or varieties. In this remark of De Candolle Dr. Houlton fully joins; and one of the most important plants, the description of which is imperfect, is that which forms the subject of his essay, yet if there is any plant in the Materia Medica of this country, that one might expect to be well described, it is surely *Hyoscyamus niger.* It is a large plant, and one that is by no means rare; tons of it are every year brought into the London market, and some one or other of its preparations is used by every practitioner. Dr. Houlton has, however, been unable to find in any work such a full and accurate description of it, as is requisite for practical Pharmaceutical purposes.

The discrepancies of those authors, who in their works have treated of hyoscyamus, are pointed out by Dr. Houlton, more especially with reference to its duration — some writers asserting that it is annual, others biennial, and again, others declaring it to be both annual and biennial, while another writer states, that there are two varieties, one annual, the other biennial. A doubt

respecting the duration of an important medicinal plant is a matter of no small consequence. Some of the authorities, by whom it is described as an annual, give it attributes which belong to the biennial plant; for instance, it is said that the roots are dug up early in the spring, and have been mistaken for parsnips. These are clearly the biennial roots, as the roots of annual plants would not be sufficiently advanced for such an error to be committed, whilst the biennial roots have considerable resemblance to small parsnip-roots in the winter and spring.

In describing this plant, one of our first-rate authors says, "That the ovary is two-celled, with numerous ovules adhering to the dissepiment." Dr. Houlton has frequently examined this part of the plant, and could never find any such adherence; he has always found the ovules attached to the placenta, one in each cell, and quite free from any adherence to the dissepiment. After years of investigation, and constant and earnest inquiry, he has further come to the conclusion, respecting the duration of the plant, that it is biennial both in its cultivated and wild state.

It is important to be aware that it is a biennial, and to know how to distinguish between the first and the second year's specimens.

The first year's plant has no stem; the leaves are all radical, each having a footstalk or petiole; the leaves are woolly, but possess but little of that odour which is peculiar to the mature plant, and they are destitute of that clamminess which is observed in those of the plant in the second year of its duration. It yields less extract than the others, and is not fit for medical purposes. The leaves of the first year die in the autumn; the root lives through the winter, and in the following spring sends up a very curious tuft of pointed pale green woolly leaves; they seem to rise from the crown of the root, but are, in fact, attached to the young stem, which rises with them; the stem grows to the height, in some situations, of four feet or more, the average height being about from two to three feet; the stem, when fully developed, is well furnished with large long leaves, deeply incised, so as to appear pinnatifid; they are sessile, and nearly embrace the stem, and have decurrent lobes, which are of a more delicate texture than the blade of the leaf: these lobes are important parts to observe in examining a specimen. The leaves are very clammy and fœtid, having an odour very similar to that of the leaves of the black-currant shrub; they are the true medicinal leaves, that part of the plant now employed in medicine. They are in perfection when the plant comes into flower, which is late in the month of May, or early in June, being influenced in this respect by the season; in a fine mild spring it will flower in May, in a cold spring it will not flower until June; perhaps, the middle of

June may be generally considered as the period at which they may be safely collected — seldom later; and they should be gathered as soon as possible after the first flowers are blown. If we wait until the seeds are nearly ripe (as we may without infringing upon the law of the College of Physicians, which says, the leaves are to be gathered before the seeds are ripe), a considerable portion will be lost, for the best leaves will be dead.

There are two kinds of hyoscyamus sold in London as the Hyoscyamus niger; one of them is a smaller plant, its leaves of a paler hue, nearly ovate, and with few incisions; nothing of the pinnatifid character about them; some of the upper leaves are entire and ovate, less hairy than the true; on some leaves scarcely any hairs can be observed, they are nearly glabrous, and nearly all petiolated; some of the uppermost are sessile, but these have no decurrent lobes, and the leaves are neither clammy nor fœtid; they have a faint hyoscyamus smell, but in plain terms, they do not stink; the main stem, in a great proportion of them, divides into three branches springing from a common centre, and each becoming about as long as the main stem; the reproductive organs are similar in all essential respects to those of the true Hyoscyamus niger. It is an annual plant, and flowers in July; its duration and time of flowering are the same as some of our writers of the present day put down for Hyoscyamus niger. It should not be employed in medicine.

The other kind is also an annual plant, flowering late in July and August; is larger and handsomer than the plant just mentioned, but smaller than the best specimens of the biennial hyoscyamus, which it very much resembles in its botanical characters and sensible properties. Dr. Houlton considers it to be a variety of Hyoscyamus niger; and though less powerful than the original species, it is, nevertheless, a very good substitute, if employed in a larger dose.

Dr. Houlton next proceeds to give directions for the management of the plant in a pharmaceutical point of view, for a proper plant may be spoiled by improper management. The metropolitan Pharmaceutist should procure the plant entire, as it is brought to market, and when in flower; the leaves should be stripped from the plant as soon as possible after the herb is received; should any delay be unavoidable, the flowers and flower-buds should be removed, for if they are allowed to remain, such is the vital endowment of these parts, so strong is the effort that they will make to fulfil the end of their being, that they will make a great demand on the plant itself, and the leaves, which have been thus made subservient to their support, will become pale and flaccid, and of course much deteriorated. The fact of flowers living upon the juices of a plant after it has been removed from the ground,

is curious to observe; the plant in question will show it well. The plant, when it cannot be immediately attended to, should not be allowed to lie in heaps, but should be carefully strewed about. Storck complains of want of care on this point in the Pharmaciens of his day. It is advisable that the leaves should be dried by the Pharmacien without the aid of artificial heat; it is not of much importance whether they are dried in the sun or in the shade. Dr. Houlton generally exposes them to a current of dry air; if the weather should be wet, it will be desirable to have a fire in the room in which the leaves are drying; some lay great stress on the drying of leaves in the dark, but this is of no practical importance; whilst the vitality of the leaf remains, light will do it no harm, but when it is quite dead, it should be kept in the dark. Living leaves require the influence of light to preserve their green colour, for they do not part with their oxygen readily in the dark, and in consequence become pale.

The officinal preparations, powder, extract, tincture, and fluid juices, are afterwards noticed by the author, who remarks that, when carefully prepared, they are all good, but the extract is the most likely to vary in strength. The different modes of preparing this latter are also slightly touched upon, and the paper concludes with a notice of the action of hyoscyamus on the system.

INTRODUCTION OF THE COCHINEAL INTO ALGIERS.

DESCRIPTION, EDUCATION, AND PROPAGATION OF THE INSECT.

BY M. SIMOUNET, PHARMACIEN OF ALGIERS.

France pays yearly to strangers a tribute of nine or ten millions (of franes) for the cochineal which she uses. Struck with this important consideration, M. Simounet wished to turn to profitable account, as regards the national interest, the knowledge which a year's residence in the neighbourhood of Valence, in Spain, had enabled him to acquire, with reference to the education and propagation of the cochineal. He thought it would be rendering a great service to France if this valuable insect were introduced into her African possessions, where it ought to thrive, in a climate quite similar to that of the south of Spain. In defiance, therefore, of the severity of the Spanish law, which awards the punishment of death for exporting the cochineal insect, he quitted Valence, provided with all that was necessary for the execution of his project.

His first attempts were unsuccessful, but by perseverance he succeeded in overcoming all difficulties, and in 1840 he obtained 500 grammes of cochineal of the best quality.

At his instigation, several agriculturists of Algiers engaged in the cultivation of the insect, and a model cochineal plantation (*nopalerie*) was established in the experimental garden at Algiers, through the exertions of M. Hardy, its director.

The government seemed to take an interest in these praiseworthy attempts, and, thanks to the zeal and enlightened devotion of M. Simounet,

the possibility of naturalizing the cochineal in Algiers, is no longer a problem.

We have extracted the following details from a communication received from M. Simounet, in which he has carefully described the physical characters of the male and female cochineal, and pointed out the course to be pursued in their education and propagation. We gladly avail ourselves of the curious facts thus communicated, and which are entitled to the greater confidence, as they are mostly the result of his own immediate observation.

DESCRIPTION OF THE COCHINEAL.

1. *Physical Characters of the Male Insect.*—The male cochineal differs entirely from the female. It is a dipterous insect, having two transparent wings ; six feet, each terminated by a small very sharp claw ; two antennæ composed of nine articulations, covered with a silky down, and six black and immoveable eyes. Its red body is covered with a white dust, its abdomen is terminated by two white silky hairs. The length from the head to the extremity of the abdomen, is one millemetre, the size is that of an oblong louse.

The period of maturity of the male cochineal is not the same as that of the female. Like the latter, he fixes himself on the cactus, but his body is not equally developed. Instead of enlarging, he becomes covered with down, at the expense of which down, after the lapse of a month and a half, a cocoon is formed. The two hairs which issue from his posterior extremity, serve to keep the cocoon always open. At the fecundating period, a month and a half after his birth, he issues backwards from his envelope, and flies from one female to another ; afterwards he dies and disappears.

2. *Physical Characters of the Female Cochineal.*—The female cochineal presents the aspect of an elliptical pea. Its body is composed of an indeterminate number of rings, giving it the appearance of a curled-up annilede. Its colour is blackish.

The body is covered with a white pulverulent down, which, being impermeable by water, serves as a defence against the inclemency of the seasons.

The feet are six in number, having two articulations, and each terminated by a pointed claw.

There are two cylindrical antennæ, composed of three articulations, of which the last is rather the longest.

Between the two upper feet are situated the organs of nutrition. These organs are composed of a small gland, and a canal of the diameter of a hair, and of a red colour, showing that the plant on which it feeds is introduced into the cellular system.

Some naturalists have stated that the cochineal is born after the death of the mother, that the body of the latter serves as an envelope for a multitude of eggs, which after her death begin to hatch. The fact is quite otherwise. The cochineal is really viviperous, and survives the production of its little family. The number brought forth according to my observations, is not 632.777, as stated by a Spanish author, but about 300.

The female cochineal is that to which we shall direct especial attention here, as she alone forms the article of commerce, and the substance so much prized for its colouring properties. It is from the female insect that carmine and the different lakes are prepared. She certainly affords one of the most valuable colours employed in the art of dyeing. On this account, the insect merits a greater degree of attention than has hitherto been devoted to it.

EDUCATION AND PROPAGATION OF THE COCHINEAL.

1. *Choice of the Cactus.*—The cochineal does not thrive well, excepting on the cactus cochinillifera, and there are several reasons for this.

In the first place, the hairy surface of this plant facilitates the peregri-

nations of the young insects. If there should happen to be much wind, not only do the feet of the insect catch in these small hairs, but the two surfaces adhere at a number of points, and its position is thus retained. It has been proved that the cacti of Africa may be employed for the propagation of cochineal, but less advantageously than the other, as the least wind dislodges the insect. Moreover, the cactus cochinillifera produces a fruit which has always a purple colour, and according to Pelletier's analysis, this plant contains the colouring matter of carmine, and of the insect which affords this valuable product.

2. *Arrangements of a Nopalery, or Cactus Plantation.*—In establishing a *nopalery*, it is desirable to select a plot of ground sheltered as much as possible from the north winds ; the ground should be laid out in furrows, and well freed from weeds.

Slips of the cactus having been procured, they should be exposed to the air for a few days, so that the part at which they have been cut may become dry. The season best adapted for making the plantation is summer.

The slips should be planted in rows, at a distance of thirty-nine inches from each other, the rows should be two yards apart, for convenience in collecting the cochineal. The plants should be watered every fifteen days in summer. The ground should be turned up once a year with the mattock or plough. The fruit of the plants should be taken off as it appears, so that the plants themselves may retain the properties, of which they would otherwise be exhausted by the fruit. The plants should not be allowed to grow to more than about sixty inches in height, the branches being spread out in the form of a fan.

The plants having attained the proper growth, may now be employed for the propagation of the cochineal.

3. *Method of placing the Cochineal on the Cactus.*—In Spain they prepare for this purpose, small cylindrical cases about two inches long, and two-thirds of an inch in diameter, open at one end. A palm leaf is used for making these cases, the net-work of the leaf allowing a sufficient opening for the insect to pass through. These cases are intended to contain a dozen of the female insects, fifty such cases are attached to a cactus by means of small thorns obtained from the cactus ferox. Metallic points for fixing them must be avoided, as the wounds occasioned by them would injure the plants.

The period at which the cochineal is about to produce its young, is known from the appearance of a small drop of a coloured substance at the posterior part of the insect. This is also the period for the collection of the insect.

4. *Method of collecting the Cochineal.*—In the first place, by means of a knife made of a reed, the insects intended for reproduction must be carefully detached and placed in the small cases already described, ready to be fixed on the plants after they have been properly washed and brushed. This first operation being concluded, cloths are to be spread on the ground under the plants, and with a brush made from the palm, all the insects which remain are brushed off ; this constitutes the available product. Three gatherings may be made in the year ; in May, July, and October. After each collection, it is very important to clean the plants with brushes, and even to wash them, so as to remove all the white matter deposited by the previous crop of cochineal. With careful attention to these directions, the plants may be made to serve for the propagation of the insect for five or six years.

5. *Method of killing the Cochineal.*—Several methods have been adopted for killing the insect. In Spain, boiling water is used ; mere exposure to the sun has been recommended, also the placing the insects on plates in an oven. But all these methods are imperfect, as they sensibly alter the quality of the colouring matter.

I recommend the following method, as being under all circumstances the best and most convenient : it consists in exposing the insects to the heat of a

water-bath, and drying them at a high temperature without exposure to light. The quality of the cochineal obtained in this way was equal to that most esteemed in commerce.

Enemies to the Cochineal.—The enemies to the cochineal are, first, a small snail which fixes itself on the cactus, and which is easily removed, on examining the plants every eight days. Another of these enemies is the *coccinelle* (lady-cow), called by the Spaniards *pintillos*. This insect produces great ravages. The means for effecting its destruction occasions the greatest amount of trouble connected with a *nopalery*. The eggs which produce the larvæ of this insect (and it is in the state of larva that it is so destructive to the cochineal), are generally found at the base of the cactus.

There is another insect, which I have only observed in Africa, and which requires to be especially guarded against, it is the *forbicina*. These get into the little cases in which the female cochineal, intended to stock the plants, are placed, and they devour the cochineal. This evil may be obviated, by closing the openings to the cases with muslin, after introducing the cochineal.

It will be evident from the foregoing, that the well-being of a *nopalery* will depend upon the exercise of much attention and vigilance.—*Journal de Pharmacie.*

ALEXANDRIAN SENNA.

Ignatius Pallme, a young Bohemian, who has been travelling in the interior of Africa, on mercantile pursuits, has lately published a very interesting account of parts of the *Belled-sondan*, with which we were hitherto only traditionally acquainted. In his work, entitled *Beschreibung von Kordofan*, he mentions, among many products of the country, several of *pharmaceutical* interest; but his information is at times at variance with the generally adopted opinion, and may, therefore, be worthy of the attention of the Pharmaceutists.

Concerning *Senna Leaves*, he says, "They are found in abundance in many parts of *Kordofan*; but the government makes no use of them, and others are prevented from turning them to advantage by the existing monopoly. They are equal in quality to those of *Dongola*, which the administration thence imports, and sells under the denomination of *Alexandrian* or *Egyptian senna*. Not the fiftieth part of these leaves, however, are natives of Egypt; for they are first met with at *Assuan*, and are erroneously termed *Egyptian leaves*: their true native country is the province of *Dongola*. The government draws its entire supply from that province. The inhabitants of the deserts in those parts collect the leaves, and receive from 200 to 400 *piastres*, for the camel-load of 3 *cantari*, at 44 *oock'ckahs*, according to the state of the market, delivered in New Dongola.

As the government would have to pay an addition of 60 or 80 piastres on the freight of each camel-load they might draw from *Kordofan*, they naturally do not obtain any senna from that province, and the leaves are left to rot unused."—*Ignatius Pallme's Travels in Kordofan*, chap. xv.

GUM ARABIC.

Pallme mentions *Gum Arabic* as one of the products of *Kordofan*, and says, "The *gum tree* (*Mimosa nilotica*, as it is termed in books) merits a different name in *Kordofan*, for the shape of the tree, the form of its leaves, and even its spines, differ from those of the *Mimosa nilotica*, which yields, however, only ordinary gum, whereas that obtained in *Kordofan* is of the finest quality; so that it is erroneously termed *Gum Arabic*."—*Pallme's Travels in Kordofan*, chap. xiii., p. 138.

PYROGALLIC ACID AS A HAIR-DYE.

Wimmer states that pyrogallic acid stains the hair brown. It may be obtained by a process similar to that for making succinic acid. Coarsely powdered nutgalls are to be subjected to dry distillation at a moderate heat, by which a part of the product is obtained as a sublimate, and the remainder passes over in the fluid form. The sublimate contained in the throat of the retort, as well as that in the receiver, is to be dissolved, by means of a gentle heat, in a sufficient quantity of distilled water, and mixed with the distilled acid. The empyreumatic oil is to be, for the most part, removed by a separatory. Shake the watery solutions of the pyrogallic acid with animal charcoal, to lessen its disagreeable odour. Concentrate the filtered liquor by evaporation, at a gentle heat, and add some spirit of wine. Any unpleasant smell which the solution may now have, may be masked by a few drops of some agreeable volatile oil.

Gray hair gradually acquires, by the use of this tincture, a beautiful blond, and ultimately a dark brown tint, which is not injured by sweat or moisture. It must be cautiously applied, as the stains produced by it on the hands, &c., are difficult to remove.

Pyrogallic acid rapidly absorbs oxygen from the air, and is converted into a dark brown colouring matter (*humin*), which is insoluble in water and alcohol.—*Buchner's Repertorium.* Bd. xxxiii. heft. 1.

TAFFETA ET CHARTA VESICATORIA ADHÆSIVA.

At the third meeting of the Scandinavian Naturalists, at Stockholm, Mr. Assessor Pripp communicated the following formula for a cheap blistering taffeta, which adheres well to the skin.

Take four parts of common frankincense (*resina abietis, or thus*), dissolve, by a gentle heat, in six parts of oil of turpentine, and then digest therewith three parts of powdered cantharides. After expressing and straining the cantharides balsam from the residue, spread it on the strained taffeta, which has been previously prepared on the opposite side with isinglass gelatine, to prevent the transudation of the balsam.

In the same way may be prepared a blistering paper, which is cheaper than the blistering taffeta.—*Buchner's Repertorium.* 2te. Riche. Bd. xxxiii. heft. 2.

TINCTURA VANILLÆ FORTIOR.

Vanilla, cut into small pieces	1 ounce.	Digest first with
Rectified Spirit.....	6 ounces,	and afterwards with
Highly Rectified Spirit	6 ounces.	

Mix the tinctures.

Experience has proved that vanilla cannot be exhausted by one digestion.

ON THE SUPPOSED PRESENCE OF PRUSSIC ACID IN THE SPIRIT OF NITRIC ETHER.

A correspondent of *Buchner's Repertorium*, in criticising Mr. Bastick's paper, published at p. 278 of the present volume of the *Pharmaceutical Journal*, observes that, though nitric ether is made with hyponitrous acid, developed by the action of starch on nitric acid, he was not aware that the spirit of nitric ether was prepared in Germany by a similar process. He then goes on to suggest that the white precipitate obtained by adding nitrate of silver to the spirit of nitric ether, and which Mr. Bastick states to be cyanide of silver, may have been chloride of silver, and that its formation may depend on the employment of nitric acid, containing chlorine, in the manufacture of the spirit of nitric ether.—*Buchner's Repertorium.* 2te. Riche. Bd. xxxiv. heft. 1.

UPON THE ORDINARY DISEASES AND MODE OF PRESERVING LEECHES.

BY J. F. RABBE.

The great mortality which has prevailed among leeches, especially during the last few years, is ascribed by the author to an incautious mode of collecting them—to a long and improper transport—to a faulty method of keeping—and to carelessness in rearing. The diseases of leeches, arising from these causes, are of a contagious nature, and may in a few days determine a considerable mortality in their numbers. The following have been observed by the author :—1st. The knotty disease (*knutsjukan*). The animal has posteriorly a peculiar appearance, and seems in several places as if constricted by a fine thread. Within the body, particularly towards the back part, small indurations of coagulated blood are met with, which are moveable, and of the bigness of a grain of mustard. The constricted parts are uniformly crippled, while the other portions remain sound. The leech may continue to live in this state one or two days. On close examination the integument is found corrugated from before backwards, eventually forming a fine cord, whereby the leech is constricted. When, at the commencement, the leech is frequently supplied with soft water, in which some sugar is dissolved, it may be preserved a longer period. The disease is common at the time of pairing, that is, from April to June, but, likewise, at other times from inattention, &c. —2d. The tinged or yellow disease (*rött eller gellsjukan*). In this affection there is an equable swelling of both head and tail, the virile member is at the same time protruded from the anus, the whole body swells, and the blood becomes corrupted. Convulsions at length set in, followed by death. This is the most dangerous disease, and proves fatal within a few hours. It is induced by ammoniacal vapour, but sometimes from other causes. Ammonia is a most deadly poison to leeches ; hence its exhalations are a frequent source of death in chemists' shops. This disease is incurable when the tail-end of the animal is the first to swell. Here it is proper to puncture the swelling with a needle, then squeeze out the tainted blood, and place the annelid in tepid water. Washing it in water also, to which $\frac{1}{30}$th of vinegar has been added, or in tepid milk, is advantageous.—3d. The buccal disease (*muusvullnad*). Leeches are frequently injured when gathered, in consequence of being roughly torn away from the spots where they have been sucking. The result is the formation of a swelling after a while in the mouth, and the animal dies from the head to the tail. This also takes place when the leeches shortly before deportation have swallowed a quantity of blood. When such leeches are huddled together with healthy ones, the latter get diseased, probably in consequence of the pollution of the water so occasioned.—4th. The mucous disease (*slemojukan*). The leeches have a miserable look, are covered with a whitish slime, giving the water the appearance of a linseed decoction ; they are dull, and die usually in about three days from behind forwards. He believes this disease to proceed from hindrance to laying their eggs during transport. He has noticed it from the end of June till August. Possibly, also, interrupted cutaneous exhalation may be a cause.

With regard to the preservation of leeches, the author recommends, after removing the dead or diseased ones, to place the others, to the number of from thirty to fifty, in a glass vessel, capable of holding a pint, filled two-thirds with river or rain-water, slowly poured in along the side of the vessel. The water should have a temperature suitable to the season of the year. The vessel ought to be closed with a piece of clean linen, not washed with soap, and set in a cool, shady, and well-aired situation. The water should be changed in winter every three days, and in summer every other day, taking care each time to pick out any that are dead or diseased. By following the above plan, the author states, that in the year 1842, out of 1460 leeches he lost only eighteen.—*Finska Läkare Sällskapets Handlingar. Första Baudet. Tredje Häftel. Helsingfors.* 1842.

THE ORIGIN OF THE APOTHECARIES OF BRUGES.

BY DE MEYER.

The first traces of a pharmaceutical corporate body in Bruges are dated as far back as the year 1297. This corporation possessed, at the commencement of the fourteenth century, a spacious hall for its affairs, a seal, statutes, and a chapel. In 1515, the chapel of St. Amand became its property, here divine service was daily performed, new members were admitted and sworn in. Besides other wares, they had the exclusive sale of medicines; members of distinguished families belonged to them, held the offices of magistrates, and other situations of dignity. The corporation being possessed of great riches and privileges, presented to the town at different times large sums for patriotic purposes; in 1790, they provided cannon for the defence of the town; in 1795, 3733 pounds of medicaments for the military hospitals. The last purveyor was Charles Ryelandt, an apothecary, who, in 1795, was chief magistrate. The first apothecary's shop known in London, was in 1345, the first in Nurnberg in 1404, and the first in France in 1336. Bruges, on the other hand, had its apothecaries from the beginning of the fourteenth century. The earliest law relative to their inspection is dated in 1497. In order to limit their numbers, an act was passed in 1582 that no person should open an apothecary's shop who had not previously studied pharmacy during three years, and adduced theoretical and practical demonstrations of his knowledge and capabilities, together with the oath of the body corporate. In 1585, a further act was enacted, touching the sale of arsenic. *In* 1683, *owing to a complaint of the apothecaries, medical practitioners were forbidden self-dispensing under a heavy penalty.* Only during the first three days of the annual fair were charlatans and tooth-drawers tolerated in the town. In 1697, on account of the previous arbitrary prices, a medicinal tax was ordained. In 1760, Maria Theresa decreed the appointment of a medical body consisting of two physicians, two surgeons, and two apothecaries (Chemists) to control all medico-legal affairs. This was annulled at the end of the eighteenth century, and replaced by a medical jury, which in its turn gave way at the union of Belgium with Holland, to the provincial medicinal commission, which now superintends all the different branches. In obedience to an imperial edict in 1807, a pharmaceutical course was established in the civil hospital, comprising chemistry, pharmacy, natural history, and botany, which in 1814 merged into the newly-organised school for surgery, midwifery, and pharmacy.—*Oppenheim's Zeitschrift*, 1843, p. 140.

REMARKS ON T. OELLACHER'S PAPER ON GUANO.

BY DR. BUCHNER,

Editor of the Repertorium of Pharmacie.

The recent analysis of guano by Oellacher is, in many points, of interest, as it not only completes and substantiates the analyses of the same substance published by other Chemists, but explains the cause of the remarkable difference in the results obtained by them. The result of the analysis of the white grains of guano is quite new and of great interest. They consist chiefly of oxalate and urate of ammonia, and contain only 9—10 per cent. of phosphates; whereas the brown guano examined by Oellacher, yielded more than 48 per cent. of phosphate of lime, phosphate of ammonia and magnesia, and phosphate of ammonia. The specimen of guano analyzed by Bertels and Voelckel contained only 23-26 per cent. of these phosphates. At all events, this analysis may, from the caution and accuracy with which it was conducted, be regarded as a *chef-d'œuvre* of chemical examination of an agricultural subject, and forms a very important addition to the scientific experiments in Horticulture and Agriculture.

There can be no doubt that the guano which has accumulated during many centuries on the small islands about the coast of Peru, between 13° and 21° of southern latitude, in great quantity, consists of the excrements of various marine birds (cormorants, flamingos, cranes, gulls, &c.), which frequent that coast in enormous swarms, and were protected by the ancient Peruvians, so that it was a capital offence to visit these islands during the breeding-time of the birds, to drive them away, or to destroy them.

Of the derivation of the word *guano* from *huanu*, which in the Inka language means *dung*, we have spoken on a former occasion, in our *Repert.*, Band lxxix. page 293. Since the English have brought whole ship-loads of this Peruvian bird-manure to Europe, and made many agricultural experiments with surprisingly successful results, we have occupied ourselves in Germany with similar experiments. Very interesting reports of the experiments performed in the botanic garden at Munich by the Professors Dr. v. Martius and Dr. Zuccarini, were published in the *Central Blatt of the Agricultural Association of Bavaria*, 1843, page 246—256, and page 421, 422. As this publication is not at the command of all our readers, we may be permitted to extract a few remarks : "Guano surpasses as a manure every other kind of dung used in the field or garden, owing to the very great amount of ammonia and uric acid, and of nitrogenous substances in general, which it contains, as also to its considerable quantity of phosphates, and small amount of water. An estimate of its extraordinary power of manuring may be formed from the following observations :—it is a well-known fact, that a field of Indian corn or potatoes on the coast of Peru which, dressed with a common manure, yields a crop eighteen times the quantity sown, gives a thirty-five or forty-five fold crop when manured with guano. The crops on meadow land are multiplied in about the same ratio when manured with guano ; Lyle obtained from 2 square feet of grass land manured in the common way, only $\frac{1}{2}$℔ of grass, but $7\frac{1}{2}$℔ after manuring with guano. Mr. Flintelmann calculated (in the *Berlin Journal of Horticulture*, 1843, No. 2) 180℔ of guano to be equal in power to 144 cwt. of good manure, and that 1℥ of guano suffices to manure a square foot of arable land.

In Germany, guano will only be of interest in an horticultural point of view, considering the expense of this article, the price of which in Peru is between 3 and 5 florins (=6*s.*—10*s.*) for 1 fanega (=238℔. French weight). In Hamburg, 1 cwt. of guano is sold for 4 to 5 rix-dollars (=12*s.*—15*s.*) if 1 to 10 cwt. or more be purchased. 25℔ (=$\frac{1}{4}$cwt.) purchased in Hamburg for the botanic garden at Munich cost $4\frac{1}{2}$ florins (=9*s*).

According to a report by Otto, in the *Gardener's Chronicle*, 1842, guano acted very favourably on camelias, pelargoniums, pines, cucumbers, &c. In the botanic garden at Munich, the experiments have been confined to flowers in pot; and the experimenters were convinced that plants watered with an aqueous solution of guano, grew very luxuriantly and quickly; the shoots were elongated, and the leaves attained double the length and breadth of those of the same species watered with pure water ; the leaves, buds, and blossoms, were developed with extraordinary rapidity. *Fuchsia fulgens, e. g.*, watered daily during four weeks with a solution of guano, bloomed twice in rapid succession ; but the cellular tissue of the plant appeared less firm, and the leaves and blossoms were less green and purple than ordinarily.

To these observations we annex, in conclusion, the following remarks :— All manures and means of enriching the soil of gardens and fields, may be classified under two heads:—1. Such as loosen the soil and promote the absorption and condensation of the atmospheric air, augment and regulate the power of the soil to combine with water. 2. Such as serve as articles of nutrition to the plants, giving elements to the soil which are assimilated by the plants and are essential to their growth. If we know these constituents, we can determine *à priori* which kind of manure is best adapted for the plant

we wish to cultivate; thus we know that the varieties of corn contain a large proportion of gluten and of phosphates, and that they will not flourish in a soil containing little nitrogen and no phosphates.* As we know that guano is very fertile of uric acid and ammonia, and of nitrogen in general, as also of phosphoric acid, we may form a certain conclusion that this bird-manure is especially adapted for the cultivation of the cerealia and grasses. Other plants again require different manure; thus experiment has proved that roses will not bear the guano as manure, and the same applies to the kitchen plants with fleshy roots, especially to carrots. To establish horticulture and agriculture, therefore, on scientific principles, careful chemical analyses of the plants cultivated, especially of their ashes, are, in the *first place*, necessary; and *secondly*, analyses of the different sorts of manure, and of the other means for enriching the soil.—*Repertorium für die Pharmacie.* Zweite Reiche. Band xxxii., Heft 3.

MISCELLANEA.

BY DR. BUCHNER.

1. ORDINARY TOOTH CEMENT

Is generally formed of a very concentrated etherial, or alcoholic solution of gum sandarac, mastic, dammar, colophony, &c. in the proportion of one-third of the solvent to two-thirds of the resins by weight. A very usual formula is: Sandarac, twelve parts; mastic, six parts; amber powder, one part, to six parts of ether. This preparation is a balsam of the consistence of copaiba; it readily dries on exposure to the atmosphere, but remains for some time soft and compressible. The mass yields, with alcohol, a milk-white solution, the turbidity depending on the masticine which is precipitated.

2. GAUGER'S TOOTH BALSAM (*Balsamum odontalgicum*),

Is chiefly in use in St. Petersburg. The recipe is as follows: Dissolve ℥ij of picked mastic in ℥iij of absolute alcohol. Pour the solution into a bottle capable of containing two pounds, and add of dried balsam of tolu ℥ix. Promote the solution by a gentle heat, and frequently shake the stoppered bottle. When the latter substance is dissolved, place the whole in a warm situation, to allow the undissolved particles to deposit. This balsam is viscid, and forms, when exposed to the air, a firm mass, which is neither acted upon by the saliva nor by other watery liquids. To prevent toothache arising from exposure of the nerve, the decayed tooth should be well dried by means of cotton or blotting-paper, and a piece of cotton wool imbued with the balsam is to be carefully inserted into the cavity.

3. VIENNA TOOTH CEMENT.

Herr V. Wirth, apothecary at Vienna, first conceived the happy idea of mixing with a viscid alcoholic solution of the resins powdered *asbestos*, which perfectly supplies the place of the pledget of cotton. His preparation is generally sold along with a tincture for cleansing the hollow teeth, and allaying toothache. The latter tincture consists of an alcoholic solution of guaiaeum and myrrh with acetic ether. Ostermaier, an apothecary at Munich, analysed this nostrum, and has perfectly succeeded in preparing it, but we are not at liberty to publish his recipe. It will, however, be a sufficient hint to the scientific man to be reminded that powdered West-

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* Thus Dr. A. Vogel, jun., latterly detected in the ashes of rye 40 per cent. of phosphate of lime, and about 30 per cent. of phosphate of potash and soda, with phosphate of magnesia.

Indian copal gains considerably in solubility in spirit by exposure to moderately warm air, and that pure alcohol to which a few drops of any essential oil are added, greatly augments its solubility.

4. OSTERMAIER'S TOOTH CEMENT.

The principle of this preparation is the formation of phosphate of lime in the cavity of the hollow tooth. For this purpose anhydrous phosphoric acid must first be formed by burning phosphorus under a large basin, fifty-eight parts of pure unslaked lime in powder, are to be mixed with forty-eight parts of this flocculent anhydrous phosphoric acid, and the necessary quantity is to be pressed into the cavity of the tooth, after the tooth has been well dried; for, if the latter proceeding be not observed, the mass will become heated, and, in expanding, fall out of its place. The application should be quickly effected, for the substance becomes quite hard and useless in the course of one or two minutes.

5. POUDRE METALLIQUE.

A new metallic cement has been lately sold as an arcanum in Paris by this name. We have not ourselves seen the preparation, but hear that it is contained in fluid mercury, on removal of which the odour of ammonia is evolved, and the remaining metal forms a hard mass. We presume it to be a triple amalgam of ammonium, silver, and mercury, with an excess of the latter, and believe the ammonium to lose a portion of its hydrogen, which escapes as ammoniacal gas when the quicksilver is removed, whilst a portion of the silver, ammonium, and mercury remains as a firm metal in the cavity of the tooth.—*Buchner's Repert. für die Pharmacie*, B. xxxiii. p. 207.

REVIEWS.

THE DISPENSATORY OF THE UNITED STATES OF AMERICA. By GEORGE B. WOOD, M.D., *and* FRANKLIN BACHE, M.D. *Fifth Edition, enlarged and carefully revised*, pp. 1368. *Grigg and Elliott, Philadelphia.* 1843.

THE first edition of this work was published in the year 1833; the fifth edition has recently appeared. The general design of the work is similar to that of our British Dispensatories, and it holds the same place with reference to American Pharmacy, that Thomson's or Christison's Dispensatory does with reference to the Pharmacy of this country. Neither of the last-mentioned works, however, is so comprehensive as that of Drs. Wood and Bache, which not only treats of all the medicines comprehended in the United States and the three British Pharmacopœias, but also contains a copious Appendix, descriptive of those medicines which are used either in America or in this country, but which are not included in either of the Pharmacopœias.

The United States Dispensatory has long held a high position in the estimation of all branches of the medical profession on the other side of the Atlantic, and, to the extent to which it has been known, even in this country.

The arrangement of the work is similar to that of the London Dispensatory. The substances comprehended in the Materia Medica are first treated of; and here much original information will

be found with reference especially to American drugs. The following quotation is from the article on "Castor Oil:"

"The oil is obtained in this country by expression. The following, as we have been informed, are the outlines of the process usually employed by those who prepare it on a large scale. The seeds, having been thoroughly cleansed from the dust and fragments of the capsules with which they are mixed, are conveyed into a shallow iron reservoir, where they are submitted to a gentle heat, insufficient to scorch or decompose them, and not greater than can be readily borne by the hand. The object of this step is to render the oil sufficiently liquid for easy expression. The seeds are then introduced into a powerful screw-press. A whitish oily liquid is thus obtained, which is transferred to clean iron boilers, supplied with a considerable quantity of water. The mixture is boiled for some time, and the impurities being skimmed off as they rise to the surface, a clear oil is at length left upon the top of the water, the mucilage and starch having been dissolved by this liquid, and the albumen coagulated by the heat. The latter ingredient forms a whitish layer between the oil and the water. The clear oil is now carefully removed, and the process is completed by boiling it with a minute proportion of water, and continuing the application of heat till aqueous vapour ceases to rise, and till a small portion of the liquid taken out in a phial, preserves a perfect transparency when it cools. The effect of this last operation is to clarify the oil, and to render it less irritating by driving off the acrid volatile matter. But much care is requisite not to push the heat too far, as the oil then acquires a brownish hue, and an acrid pepperish taste, similar to those of the West India medicine. After the completion of the process, the oil is put into barrels, and thus sent into the market. There is reason, however, to believe that much of the American oil is prepared by merely allowing it to stand for some time after expression, and then drawing off the supernatant liquid. One bushel of good seeds yields five or six quarts, or about twenty-five per cent. of the best oil. If not very carefully prepared, it is apt to deposit a sediment upon standing; and the apothecary frequently finds it necessary to filter it through coarse paper before dispensing it. Perhaps this may be owing to the plan just alluded to of purifying the oil by rest and decantation.* We have been told that the oil in barrels occasionally deposits a copious whitish sediment in cold weather, which it redissolves when the temperature rises. This substance is probably margarine, or an analogous principle. A large proportion of the drug consumed in the eastern section of the Union is derived, by way of New Orleans, from Illinois and the neighbouring states, where it is so abundant that it is sometimes used for burning in lamps."

* "We find the following sentence in Christison's Dispensatory, p. 793: 'If the statement made above, on the authority of Boutron-Chalard, be correct [that no margarine is deposited by castor oil previously heated to 212°], this circumstance (the deposition of a crystalline matter by castor oil in cold weather), instead of being an objection, is strong proof of the American oil being really cold-drawn, and not prepared by dry heat and ebullition, as Drs. Wood and Bache have represented.' If it be intended here to throw discredit on our statement, we have only to reply, that we have ourselves witnessed the arrangements above described, and had the account of the steps of the process from the manufacturers, as it was at the time conducted in this city. That American castor oil is also prepared by mere expression, rest, and decantation, we have stated in the text. We are disposed to give the preference to that prepared by the former process, as freer from impurities, and, therefore, likely to keep better, and as milder in its action, in consequence of the volatilization of a portion of the acrid principle."

In the second part of the work, which treats of the "Preparations," there is much useful practical information for the Pharmaceutist. This part is prefaced by some brief instructions for conducting Pharmaceutical operations; for which, as well as for some other articles, the authors of the work say they are indebted to Mr. Daniel B. Smith, a druggist in Philadelphia, and President of the Philadelphia College of Pharmacy. The formulæ of the United States and three British Pharmacopœias are clearly distinguished and collated.

The last division of the work consists of the Appendix, which contains short articles on a great number both of simple drugs and of preparations not noticed in the Pharmacopœias. We extract the following from this very useful part of the work:

"IODO-HYDRARGYRATE OF POTASSIUM.—It has been found by Chemists that different iodides will unite together in definite proportions, forming compounds, which are called by Berzelius double iodides. Bousdorff, of Finland, and Dr. Hare, of this city, with greater reason, have viewed these combinations as a peculiar kind of salts, in which one of the iodides performs the part of an acid, the other of a base. The substance, the name of which is placed at the head of this article, is one of these compounds, and was presented to the notice of the profession as a new remedy of remarkable powers, in February, 1834, by Dr. William Channing, of New York (*Amer. Journ. of Med. Science*, xiii., 388). It consists of the biniodide of mercury acting as an acid, united with the iodide of potassium as a base. But as these two iodides combine in at least two proportions, it is necessary to indicate the particular combination employed by Dr. Channing in his therapeutic experiments.

"In a difficult case of pectoral disease, in which the ordinary remedies had failed, Dr. Channing determined to make trial of one of the iodides of mercury. He selected the biniodide; and in order to have it in the liquid form, it being insoluble in water, he dissolved it in a solution of iodide of potassium. He was struck with the chemical changes which the compound solution underwent; and on pursuing his observations, he found that the two iodides really united by the intervention of the water: for by the assistance of an operative Chemist, he was enabled, by evaporation, to obtain them in union, in the form of straw-coloured, needle-form, deliquescent crystals. He next found, upon consulting the European authorities, that Bousdorff, who had taken the lead in investigating similar compounds, had discovered the same salt in 1826.

"Dr. Channing analyzed the salt with which he experimented, and found that it consisted of one equivalent of biniodide of mercury, and two of iodide of potassium. This he determined by ascertaining that an aqueous solution of little more than eight grains of iodide of potassium would dissolve, and combine with eleven grains of biniodide of mercury, without being liable to decomposition, when largely diluted with water.

"The combination here indicated corresponds with one of the double iodides of mercury and potassium, as described by Thenard. (*Traité de Chimie*, 6th edit., iii., 493). The other is represented by this author as consisting of a single equivalent of each iodide. When copiously diluted with water, every two equivalents of this iodide let fall one equivalent of the mercurial iodide; thus evidently converting the salt into the medicinal double iodide. The same decomposition, by the use of abundance of water, is noticed by Dr. Channing. For remarks on these double iodides, see a paper by Mr. Ambrose Smith (*Amer. Journ. of Pharm.*, xii., 265).

"Dr. Channing attributes to this preparation the effects of diffusing excitement, and equalizing the circulation. In the different cases in which he tried it, he thought he saw evidence of its favourable influence on the lungs, in allaying cough and improving expectoration; on the alimentary canal, in restoring the healthy secretions; on the kidneys, in reviving their activity; on the skin and cellular tissue, in cicatrizing superficial ulcerations; and on the absorbent and exhalent systems, in causing the disappearance of effused fluid. The principal diseases in which he found it useful were, chronic bronchitis, hooping-cough, tonsillitis, chronic gastro-enteritis, dyspepsia, ascites, anasarca, amenorrhœa, leucorrhœa, eruptions, and scrofula. In some cases of phthisis, it mitigated the symptoms, and appeared to prolong life.

"Dr. Hildreth, of Ohio, has tried this preparation, and reports favourably of its effects in ordinary dyspepsia, unattended by organic disease, enlargements of the spleen, &c.

"The average dose of the remedy may be stated at the twelfth of a grain three times a day; but in peculiar constitutions, not more than the forty-eighth, the ninety-sixth, or even the two-hundredth of a grain daily can be borne. For the convenience of Physicians who may wish to make trial of the remedy, we give the following formula, deduced from the statements in Dr. Channing's paper:

"Take of Iodide of Potassium, $3\frac{1}{2}$ grains.
Biniodide of Mercury, $4\frac{1}{2}$ grains.
Distilled Water, 1 fluid ounce.

Dissolve first the iodide of potassium, and then the biniodide of mercury, in the water. The compound salt in this solution may be assumed to amount to eight grains, though there is a small excess of the iodide of potassium. Of the solution, from two to five drops, containing from the thirtieth to the twelfth of a grain, may be given three times a day."

A Statement by the Society of Apothecaries *on the subject of their Administration of the Apothecaries' Act, with reference to some supposed features of Sir James Graham's promised Measure of Medical Reform.* 8vo, pp. 44. *London: Samuel Highley, 32, Fleet Street.*

The object of this pamphlet is to demonstrate, by an appeal to facts, that a continuance of the system now in force in reference to the Apothecaries, would be conducive to the welfare and credit of the profession. It having been currently reported that the measure about to be brought before the House will be subversive of the powers at present enjoyed by the Apothecaries' Company, that body very naturally and properly feels desirous of upholding its claim to recognition, as the executive board for regulating the education, examination, and licencing of its members.

It is mentioned in the pamphlet, that at the time the Apothecaries' Act was projected, some doubts existed in the minds of its originators as to the propriety of confiding in the Society of Apothecaries the duty of examining candidates and granting licences; accordingly it was proposed to constitute a Board of Examiners, comprising also a certain number of Physicians and Surgeons. This honour was declined by these two bodies; on which account the Apothecaries undertook the task, and the bill

was framed in such a way as to give them the entire control and management of their own body, as well as the power of prosecuting illegal practitioners. The manner in which they have acquitted themselves is pointed out and defended in the pamphlet. The gradual increase of severity in the examination keeping pace with the enlargement in the curriculum of education, the improvement in the character and qualifications of the candidates, with statistical information respecting the admissions and rejections, constitute the principal facts upon which the arguments are founded.

On perusing the whole statement we were struck with the analogy which exists in some respects between the position of the Chemists and Druggists at the present time, and that of the Apothecaries at the time of their first embarking on the management of their own affairs. It was recently proposed to constitute a Board of Examiners, consisting of Physicians and Chemists; but the College having declined to interfere, the Chemists took the responsibility upon themselves, and have conducted the examination of their members for about twelve months. They have strenuously supported their claim to the privilege of regulating their own body, by exerting themselves, as did the Apothecaries, to introduce and carry into effect a judicious system; and so far as the short space of time will justify an opinion, their success has been admitted by all parties to be greater than might have been expected.

The arguments advanced by the Apothecaries in favour of the independence of their body, apply with equal if not greater force to the Chemists, in whose case the objections urged on the other side do not apply. It is not at all likely that any attempt would have been made to amalgamate the Apothecaries with the other bodies in the profession, and thus to remove from them their distinctive privileges and powers, if they had not changed their original and legitimate character, by assuming all the qualities and duties of medical practitioners. So long, therefore, as the Chemists restrict themselves to the department of Pharmacy, and avoid that gradual encroachment on medical practice, which experience has shown to be incompatible with the independence of a Pharmaceutical body, they may fairly claim the privilege of not only retaining their present position, but materially improving it; and it will be wise in them to profit by the experience of their predecessors in the Pharmaceutical department.

A Manual of Medical Jurisprudence. By Alfred S. Taylor, Lecturer on Medical Jurisprudence and Chemistry in Guy's Hospital. Small 8vo, pp. 679. *John Churchill, Princes Street, Soho.*

In recommending this work to our readers, we think it right to observe, that some portions of it are addressed exclusively to

medical practitioners, and are consequently out of the province of the Chemist. The whole subject possesses much general interest, as it involves the character, and in many cases the lives, of individuals under a great variety of circumstances, and forms the substance of some of the most exciting discussions in the public papers. But as a matter of professional study, there is only one branch of it which appertains to the business of the Chemist; and as we are not acquainted with any work exclusively devoted to this particular branch, we may be allowed to recommend one in which the Chemist will find not only all that he requires, but much more.

In most cases of poisoning, everything depends upon the early administration of the proper antidote; and a delay of half an hour may be fatal to the patient. Consequently the Chemist is often applied to on an emergency before a medical man can be found, and he ought to be able to take prompt and judicious measures, and, in fact, to superintend the case until the medical man arrives. When it is known what poison has been taken, little if any delay need occur; but when this is a matter of doubt, more or less time, according to the skill of the Chemist, will be required in testing any portions of the suspected substance which may by chance be submitted to him for examination. An acquaintance with Toxicology, therefore, forms a necessary part of the Chemist's education; and a standard work on this subject ought always to be at hand for reference, in case any doubt should exist as to the best course to be pursued.

Mr. Taylor's Manual contains 279 closely-printed pages on the nature of poisons, the tests, antidotes, and mode of treatment. A great variety of illustrated cases are introduced, many of which have been collected by the author from the hospitals, medical periodicals, and other sources within his reach, in addition to such as are cited in other treatises on medical jurisprudence. The remainder of the work relates chiefly to wounds, infanticide, suffocation, insanity, and other subjects of a medical nature, which, however important they may be to the professions of the law and physic, have no reference to Pharmacy.

On Calculous Concretions, *in the Horse, Ox, Sheep, and Dog; being the substance of Two Essays read before the Veterinary Medical Association.* By W. J. T. Morton, Lecturer on Medical Chemistry and Veterinary Materia Medica, &c. &c. *Illustrated by coloured Engravings.* 8vo, pp. 84. *Longmans, Paternoster Row.*

Professor Morton, whose *Manual of Pharmacy* we have noticed in our leading article of this number, has been for many

years a zealous labourer in the cause of science. Being at the same time a practical Chemist and a teacher at the Veterinary College, he has had an opportunity of contributing to the advancement which has lately taken place in the veterinary profession; and much credit is due to him for what he has done.

The above treatise commences with a few general remarks on calculi and their formation, with a classification of the calculous concretions into stomachical and intestinal calculi, urinary calculi, and occasional calculi. Each of these classes is subdivided, and the causes, symptoms, chemical composition, and means of removal, are described with illustrative cases, which demonstrate the practical utility of the work.

LESSONS ON CHEMISTRY, *for the Use of Pupils in Schools, &c.* By WILLIAM H. BALMAIN. pp. 208. *Longman, Brown, and Co., London.*

A work of this description, for affording elementary instruction to youths commencing the study of Chemistry, and especially for use in schools, has been much wanted. It must be admitted, however, that it is no easy task to convey a correct knowledge of the principles of a subject so comprehensive as that of Chemistry, in a few brief and yet easily intelligible lessons. It is difficult to avoid sacrificing perspicuity or correctness of detail, in attaining the conciseness essential to the design of such a work. In the little book before us there is some evidence of this kind of defect, but the design of the book is good, and it will no doubt prove useful to the class of students for whom it is intended.

THE RAY SOCIETY,

Instituted 2d February, 1844.

WE have received a Prospectus of this Society, the object of which is stated to be—

"The promotion of Natural History, by the printing of original works in Zoology and Botany—of new editions of works of established merit—of rare Tracts and Manuscripts—and of Translations and Reprints of Foreign Works, which are generally inaccessible from the language in which they are written, or from the manner in which they have been published."

The Society is to be supported by annual subscriptions of one guinea from each Member: it is to be under the management of a Council biennially elected.

Communications to be addressed to Dr. GEORGE JOHNSTON, Berwick-upon-Tweed, or J. S. BOWERBANK, ESQ., 45, Park Street, Islington.

TO CORRESPONDENTS.

Mr. Arnall has sent us a specimen of a preparation which he received for examination, labelled, "Anthokyan, *the peculiar colouring matter extracted from violets.*" It is sold for making syrup of violets. It contains none of the colouring matter of the violet, as the colour is not changed to red by an acid, but is discharged on the addition of nitric acid. It is, therefore, most probably a preparation of indigo, and its sale for the above purpose is a fraud. We have lately seen a blue variety of heart's-ease offered for sale for making syrup of violets. Such practices ought to be exposed.

Mr. Williams.—*Red sulphuret of mercury* was formerly called *cinnabar of antimony*, being one of the products obtained in the formation of "butter of antimony," by the distillation of a mixture of bichloride of mercury and sulphuret of antimony.

A. P. S. (Manchester).—The citrate and ammonio-citrate of iron, now extensively used in medicine, are compounds of the *peroxide* of iron.

T. A. S. wishes to know how to prepare the following prescription:

℞ P. Acaciæ, ℥iss.
Cetacei, ℥ss.
Aquæ, ℥iv.
Sacchari, ℥ss. M.

In a mortar previously warmed, mix the gum with enough water to make a thick mucilage; add to this the spermaceti melted. Triturate until mixed, adding gradually the water previously warmed, and in which the sugar has been dissolved. With all these precautions, mucilage will not make so good a mixture as yolk of egg with spermaceti.

"Spora," requests an answer to Mr. Redwood's 8th question, page 521, in our last number. [Mix the gum, the syrup, and a small quantity of peppermint water, in a Wedgwood mortar, so as to form a mucilage, care being taken that the gum be entirely dissolved; add now a small quantity of the copaiba, and rub these ingredients together until they appear perfectly blended; further additions of copaiba are then to be gradually made, continuing the rubbing, and as the mixture thickens, small quantities of peppermint water must be added, so as to keep it about the consistence of mucilage. If this last precaution be not adopted, a thick magma will be formed, which will not subsequently mix with the water. The whole of the copaiba being added, and a perfect emulsion formed, add the remainder of the peppermint water previously mixed with the tincture.]

J. H. T.—When "Pil. Hydrarg. Chlorid." is ordered in a prescription, we should understand the prescriber to mean Pil. Hydrarg. Chlorid. comp.

A. P. S. (Bedale), should address his enquiry to the Editor of *The Veterinarian* (published by Longman and Co.).

Mr. Barr suggests, that some time having elapsed since the process of displacement was introduced to the notice of our readers in this Journal, further information might be interesting if those who have prosecuted experiments upon it, would publish the result.

"A Country Member" inquires whether it be customary in London to furnish lemon-juice when alkaline mixtures are ordered to be taken with it? [This is sometimes done, but not generally, being a matter of arrangement between the Chemist and the Patient.]

"Pyramis" (Gainsboroough).—Hooper's Medical Dictionary.

"℥ij."—A solution of sealing-wax in rectified spirits of wine is used as a red varnish for corks, &c.

"Galen" wants a formula for Liquid Harness Blacking.

M. P. S.—Preston Salts: See vol. iii., page 265.—Ginger-Beer Powders: Sugar, ℥ij.—Sesqui-carb. Soda, ℥ij.—Ginger Powder, 4 grs.—Essence of Lemon, 1½ drops, with 35 grs. of Tartaric Acid.—Violet Hair Powder: Powdered Starch, 7 oz.—Orris Powder, 1 oz.—Otto of Roses, 1 drop.—Essence of Bergamot, 8 drops.

"B."—Arquebusade : Mint, ℔j.—Angelica tops, ℔j.—Wormwood, ℔ss.—Angelica seeds, ℥v.—Oil of Juniper, ♏ 34.—Sp. Rosemary, Oiiiss.—Sp. Vini Rect. gal. 5.—Water, gal. 4.—Distil, *s. a.* 6 gal.

P. (Cork), inquires which is the best shaving-paste? [Naples Soap.]

"A. B."—We believe the manufacture of unfermented bread, *for sale*, by the process published in this Journal, would be an infringement of Dodson's patent.

"A Member" (London), objects to the bye-law of the Society which enacts that "no person shall be a Member of Council or Auditor, who has been a bankrupt or insolvent, unless he shall have subsequently paid his creditors in full." Observing that a failure in business may be the result of unavoidable misfortune, and that it would be unfair to disqualify a person from holding an office of distinction simply because he was unfortunate. [We think it would be very unfair to tax a person so circumstanced with the arduous duties alluded to, involving a sacrifice of time, which, if he could afford to bestow it, is in fact, the property of his creditors.]

"Amor Nummi."—Candidates who pay ten guineas on passing the Major Examination will afterwards pay only one guinea annually instead of two. The other questions should be addressed to the Secretary, with the name.

"A Member"? (Birmingham) inquires what benefit he is likely to derive from paying his subscription of One Guinea a year? [We suspect that our Correspondent is not a Member, as he would otherwise know the amount of subscription and the objects of the Society.]

"X." (M.P.S.) expresses himself rather strongly and with some degree of weight in favour of a reduction in the subscription, and inquires when this is likely to take place? [We are not authorised to give a definite reply; but we think it probable that the subject will before long again claim the attention of the Council.]

Mr. M'Culloch has also sent us a letter for insertion on this subject, but we regret that it arrived after the number was made up; and is, therefore, deferred till next month.

T. E. and J. M. inquire when the Council intend to apply to Parliament for a bill to protect qualified Chemists and Druggists? [As soon as the proper time arrives.]

"Pharmacien" and a "Member" (Manchester) enclose handbills issued by Chemists, which reflect no credit on the parties.

"Alpha."—Besides the usual method of volatilizing it on paper, the adulteration of an essential oil with a fixed oil may be detected by adding spirit to the suspected oil, when any fixed oil, insoluble in spirit, will be separated. The specific gravity will also be a good criterion to assist the judgment.

"P— B—."—Tannic acid would more correctly represent tincture of galls than gallic acid; but either might be used for the purpose specified.

"A Member" wishes to be informed the best method of making "the syrups for lemonade and gingerade."

"An Apprentice" (Plymouth).—(1.) See our last number, page 532.—(2.) Armenian bole is a silicious earth, the colour of which is occasioned by the presence of iron.—(3.) Selecta è Præscriptis.

"An Asste." (Birmingham) asks, what he should use when Sodæ subcarb. is ordered? Sodæ subcarb. P. L. 1824; Sodæ carb. P. L. 1836.

A. F. and "Rogator" inquire where the Pharmaceutical Journal may be purchased? [Of any Bookseller in Town or Country.]

Advertisements to Mr. Churchill, Princes Street, Soho.

Instructions from Members and Associates, respecting the transmission of the Journal, to Mr. Smith, 17, Bloomsbury Square, before the 20th of the month.

Other Communications to The Editor, 338, Oxford Street (before the 20th, if answers be desired in the ensuing number).

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